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"TWO THOUSAND OPERATIONS FOR APPENDICITIS,"

WITH DEDUCTIONS FROM HIS PERSONAL EXPERIENCE.

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It seems to me that a retrospective consideration of the subject of appendicitis might be of value to the general practitioner and the surgical specialist, as well as to the occasional operator in this disease. It would be useless to tabulate such a large number of cases unless all of the phenomena of etiology, symptomatic manifestations, clinical course, technical procedure, pathological conditions, and final results were included. This would mean an enormous labor from which, I believe, there would be no adequate return. The first operation, in its modern sense, was performed by me March 2, 1889. The two-thousandth was completed July 22, 1903.

I will refrain from going into the history of the struggles of the pioneers in the operative treatment of appendicitis. There is no procedure in surgery where the battle was so fierce and so continuous and where the statements of the uninformed were so personal, so galling, and so unjust as in the contest for and against early operation in acute infective appendicitis. Looking backward one can scarcely comprehend how a so-called intelligent profession was so slow in accepting the overwhelming force of numbers and facts, which could not be altered by theory or speculation. It is, however, but a repetition of the past and an index of the future; the medical profession, as a body, always has preferred to theorize and dream rather than analyze, investigate, or accept facts. This is particularly true of the pathological conditions of internal organs, and what could be said regarding the attitude of the profession

toward the diseases of the appendix in March, 1889, can be said to-day of diseases of the stomach, the pancreas, and, with little reserve, of the kidneys.

The diversity of opinion expressed as to the presence or absence of pus in acute, infective appendicitis, in the discussions in 1889, 1890, and 1891, is most interesting reading for the student of medical progress. Practitioners whose cases recovered from the attack insisted that they were catarrhal inflammatory processes and recovered without the formation of pus, notwithstanding the evidence produced by every operator of that time that pus was present in all of the acute infective cases operated in the early stages—now a generally recognized fact. Every one recalls how reluctantly the advocate of the soothing, death lullaby of the opium treatment vacated his position, and how equally persistent and belligerent was the advocate of the death-groaning calomel and castor oil participant; the still unconquered, nine-lived procrastinator has not yet capitulated, each and every one of these standing out against the most convincing presentation of pathological phenomena.

Surgical Anatomy. The appendix, from a surgical standpoint, can be considered as located almost universally in the right lower quadrant of the abdomen, between a line drawn from the umbilicus to the symphysis and one drawn from the umbilicus to the tip of the eleventh rib on the right. The base of the appendix is usually found a little above a line drawn from the umbilicus to the anterior superior spinous process of the ilium and about two-fifths of the distance from the process (McBurney's point). In inflammatory conditions the appendix is usually found extending downward from this point. In children it is usually higher up. It may even approximate the costal arch and become attached to the margin of the liver or gall-bladder, or rest behind the caput coli. Once I found it between the liver and the abdominal wall. Below, it may be closely adherent to the inguinal tract, hanging over the margin of the pelvis; or, indeed, be found in the vesicorectal or Douglas' pouches. When the point of extreme sensitiveness cannot be determined in the usual position, examination of the loin and rectal and vaginal examinations should never be overlooked, as in about 5 per cent. of the cases I have found the appendix in the pelvis, and in a large proportion of these the abscess was entirely confined to the pelvis, not always to the right half of the pelvis, but filling in the entire pelvis, the vesical tenesmus and urinary retention indicating its location. In only two cases did I find the appendix to the left of the middle line. Once it was adherent to the left tube and the second time to the transverse colon. It was rarely found behind the peritoneum, although abscesses in the retroperitoneal space, from acute appendicitis, were not rare, due to perforation and not to malposition of the appendix. It is many times embedded in the wall of the caput coli. When found in that position in the

intermediate operations I have always considered it, not an anatomical anomaly, but a pathological sequence. In the intermediate operations, as well as in the acute stage, it is occasionally found attached to the ileum. Twice I found it strangulated and gangrenous in femoral hernia, and a number of times, in the acute and intermediate operations, in inguinal hernial sacs. The presence of acute infective appendicitis should be suspected in all right-sided hernias, where there is rapid elevation of temperature, with nausea and vomiting, shortly after the manifestation of strangulation, as simple intestinal strangulation in a hernial sac never gives a primary elevation of temperature. I have never found the appendix in an umbilical hernia.

The length of the appendix varied greatly—from three-quarters of an inch to six and three-quarter inches. The mesoappendix is from two and a half to four inches in length. In pathological conditions it may be entirely absent; that is, the appendix may be adherent to the intestine or to the abdominal wall. The mesoappendix is attached for about two-thirds of the length of the appendix; occasionally it is of enormous thickness, containing large deposits of fat. Many times the tip is adherent and an opening exists between the tip and the mesentery. I have had four cases of intestinal obstruction through this opening.

The proximal end at the valve of Gerlach is usually the smallest portion of the lumen. In acute infections of the mucosa, this opening becomes occluded from the œdema, producing retention of the infective material, as manifested by the acute primary colic and reflex primary nausea. The most severe infection and necrosis of the mucosa, however, does not occur at its most narrow part, but most frequently at about two-fifths of its length from the tip toward the base. The lumen of the body of the appendix varies greatly. Where it has been subject to high retention with subacute infection it enlarges gradually; where it has been subject to accumulating pressure with occlusion at the base without infection, it enlarges greatly to the size of the adult thumb or even larger. When the infection is severe the infiltration is great, and in these cases the subsequent cicatricial contraction diminishes the size of the lumen below its normal anatomical capacity, even to complete obliteration, when the epithelium is destroyed. These are the same pathological changes that take place in all of the hollow viscera under the same conditions, and particularly in the gall and urinary bladders.

The appendix has no vessel running parallel to its long axis; the vessels of the mesoappendix run directly through the mesentery to the appendical wall. At the mesenteric attachment there is no peritoneum. This is the weakest point in resistance under infection, and is the most common location of perforations where foreign bodies are present.

ETIOLOGY. When the disease was first recognized as a surgical affection, the acute infective lesions were considered to be due to the usual causes which produced enteritis in the remaining portion of the intestine and it was considered essentially a disease of the summer months. Now since we have become more familiar with it we find that it is almost as common in winter as in the summer. We find that it does not come on under the same climatic or dietary conditions as the other types of enteritis; that it most commonly follows exposures such as would produce so-called "cold" of the respiratory tract. So commonly is it a sequence of such exposure that a very prominent Chicago physician at one time considered it essentially a rheumatic manifestation. This, however, we do not accept.

Foreign bodies, as fruit seeds, gallstones, capsules, etc., were present in a little less than 2 per cent. of the cases. Fecal concretions were found in 38 per cent., and we believe that the erosion of the appendical mucosa by these foreign bodies produces an atrium for the admission of the infective flora into the tissue and precipitates under favorable conditions the acute attack. Indiscretions in diet appear to have little if any effect as an etiological factor.

The types of infective flora found in cultures and stainings from the appendices vary in the following order of frequency: bacillus coli communis, staphylococcus pyogenes aureus and albus, streptococcus, pneumococcus, bacillus tuberculosis, actinomycosis.

Appendicitis occurs in all classes with about equal frequency. In my work it has been a little more frequent in males than in females. I do not consider that it is contagious or infectious. It does seem, however, to have family predilections. This I would rather consider due to the conformation of the appendix or the diminished resistance to infection in some families and the comparative immunity to infection in others. I have not infrequently had two members of the same family in bed with the disease at the same time.

SYMPTOMATOLOGY. The symptoms in the order of their occurrence may be mentioned as: first, pain in the abdomen, sudden and severe, followed by (second) nausea or vomiting, even within a few hours, most commonly between three and four hours after the onset of pain; third, general abdominal sensitiveness most marked in the right side, or more particularly over the appendix; fourth, elevation of temperature, beginning from two to twenty-four hours after the onset of pain. In severe cases the temperature reaches 102° to 103° between eight and twelve hours after the initial pain. The symptoms occur almost without exception in the above order, and *when that order varies I always question the diagnosis.* If the nausea and vomiting or temperature precede the pain I feel certain that the case is not one of appendicitis. Where the

temperature alone precedes the pain for a day or even two or three, then I am always fearful that it is typhoid fever with a typhoid ulcer in the appendix. I have had seven cases of this class; the first three were operated and typhoid ulcers were found in the appendix; the last four were not operated; all went through classic typhoid courses after the appendical manifestations and all seven cases recovered. Where sensitiveness has been present for a number of days, and particularly where it is low in the pelvis, I have found the focus other than appendical—that is, due to infection of the tube, tuberculous peritonitis, etc.

Pain was a constant and uniform symptom and usually colicky in character, although patients varied in their expressions of its severity. In not a single case was it absent as an initial symptom. It usually reached its acme of intensity about four hours after its onset. It subsided gradually in the majority of cases. When it subsided suddenly, as it sometimes did, within the first thirty-six hours, the subsidence was due either to liberation of the infective material through the neck of the appendix into the caput coli, rupture of the appendical wall, or complete gangrene of the appendix. Under these conditions the pus pressure was relieved and the pus absorption diminished or stopped. With the cessation of pain in these cases, whether it was due to gangrene, intestinal escape or perforation, came the diminution or cessation of absorption, *but not* necessarily a *diminution* or *cessation of danger*, as is so commonly though erroneously interpreted, and often with fatal result.

The secondary pain, after the first thirty-six hours, is usually not colicky in character, but of the typical inflammatory type and due to periappendical involvements. Severe pain after the primary subsidence is always a signal of great danger, as it announces a beginning peritonitis from perforation.

The primary nausea and vomiting is reflex, due to overdistention of the appendix from the accumulating products of the infection, and is the same type of nausea and vomiting that we have with stone suddenly impacted in the neck of the bladder or suddenly passed into the ureter. There is usually only one or two efforts at emesis and the nausea then passes away. The secondary nausea and often persistent vomiting is due to the periappendical involvement; that is, infection of the peritoneum, and is of the same character and often the same persistence as vomiting from perforation of the tube, intestine, or stomach, into the peritoneum. In extensive peritoneal infections the vomiting continues to the fatal termination, increasing in frequency as time advances and as absorption increases.

The abdominal sensitiveness is first diffuse, although the abdominal wall is not particularly rigid. When the appendix becomes fully distended and tense it will not tolerate pressure and is pro-

tected by a marked rigidity of the abdominal muscles, the same as the gall-bladder and urinary bladder are protected under similar conditions when overdistended. As soon as the acute tension subsides, the general sensitiveness disappears. It becomes circumscribed to the area of the appendix, whether it be at McBurney's point, in the subhepatic space, or in the pelvis. When absent above, the pelvic examination should never be overlooked. If the sensitiveness has been once circumscribed to a small area and increases suddenly, preceded by pain and by secondary nausea and vomiting, it strongly indicates a perforation of the circumscribed adhesions and an infection of the general peritoneum. In endeavoring to palpate the appendix, after the first twenty-four hours, the greatest care and caution should be exercised. Severe pressure is likely to produce separation of friable adhesions that are of life-saving importance.

Temperature was not absent in a single acute infective case in its *early stage*, that is, in the first thirty-six hours after the onset of the symptoms. In the acute severe infections it is present in a few hours. In acute obstructions of the neck of the appendix, with mild infection, it appears later. In the calcular obstructions it does not appear until about the twentieth to the twenty-fourth hour after the beginning of pain. It is always present in the early stage of acute appendicitis. I would not operate on a case where I was confident that no temperature had been present in the first thirty-six hours of the disease. I came very close to making an unnecessary laparotomy in a case of this character. The patient had typical acute onset of pain, nausea, and vomiting, local sensitiveness and tumor; so sensitive was the tumor that manipulation was impossible. She was a doctor's daughter. Her father insisted that there had been no temperature at any time, but I felt that it was a case of the proverbial shoemaker's child, and that attention had not been close enough to warrant the statement that no temperature had been present. After she was on the table and I had taken up the scalpel, I laid it down again, saying that I had never had a case without elevation of temperature. With some manipulation the tumor disappeared under the costal arch and proved to be an acutely displaced kidney; no operation. When the patient recovered from the anæsthetic she informed us that in play at a picnic the second day previous she was rolled across the edge of a board fence, the pressure being from behind forward, just below the last rib. It caused her severe pain in her side and the pain continued from that time. This produced an acute displacement of the kidney with the symptoms of pain, reflex nausea, vomiting and extreme local sensitiveness, but with absence of temperature.

The temperature may all subside within twenty-four hours after the onset, and if it subsides suddenly I am fearful that the cause of its subsidence is a gangrene of the mucosa, with failure of further

absorption and therefore an intermission of temperature. Where it subsides gradually from thirty-six to fifty-two hours after the onset, then I believe it is due to a cessation of pressure from rupture of the appendix either into the mesoappendix or to circumscribed adhesions around the appendix. The temperature here, as in other places, must be recognized not as a manifestation of pus, but as a manifestation of absorption of the products of infection; without the absorption there is no elevation.

A remission of temperature of one or two or three degrees with subsequent gradual elevation means an infection of a new area of tissue. The temperature may go below 99° and remain there after the initial elevation, and still a large quantity of pus be present, either circumscribed or diffuse, in the peritoneum.

Secondary elevation of temperature should always be noted with apprehension, as it indicates a fresh invasion of tissue, a thrombophlebitis, a peritonitis, or cellular infiltration. These elevations are indications for immediate operation, and that usually means immediate drainage. Under these circumstances no extensive laceration of tissue or separation of adhesions should be attempted for the purpose of making a complete operation. The focus of pus should be drained and, as a rule, nothing more done

Leukocytosis. For a time it was believed that much valuable information could be obtained by ascertaining the excess of leukocytes. The more extended our experience, the less valuable it became. Leukocytosis may be considered a blood reaction to the absorption of septic products. Infection may be present without producing the blood reaction. A sudden and great increase in the number of leukocytes, supported by the other symptoms, is usually indicative of an extensive peritonitis.

Pulse. The character of the pulse has little value in the differential diagnosis of appendicitis. In children, when there is rapid absorption the pulse rate is very high. In the later stages of peritonitis, when it becomes compressible, rapid, and feeble, it is a fair index of the degree of intoxication and a guide to the prognosis rather than to the extent of the inflamed area.

In two cases of perforative appendicitis, where the perforation had occurred a number of hours before, the patients were walking around, with normal pulse and normal temperature. A considerable quantity of intestinal contents was free in the peritoneal cavity. One of these patients walked into the hospital with his doctor, did not appear materially sick, though the perforation had taken place eight hours before he presented himself. There had been some nausea and pain immediately after the perforation. That subsided and there was no change in his pulse or temperature. He was put on the table, the abdomen opened, and a large quantity of seropurulent material was found in the peritoneal cavity; also a con-

siderable quantity of fecal matter, which had leaked through a calcular perforation in the appendix.

Tumor. In the very early hours of appendicitis, while the inflammatory process is still confined within the appendix, an examination of the abdomen reveals an apparent tumor. The centre appears to be hard and fixed. It is oblong and about the size of the thumb. One feels convinced that the appendix rests close to the abdominal wall. The impression of tumor under these conditions is due to the spasmodic contraction of the muscle fibres directly over the situation of the appendix. When the patient is placed under the anæsthetic the tumor entirely disappears and, indeed, the appendix may be in the retrocæcal position and many inches from the abdominal wall. So frequent is this deception that I feel it should be constantly borne in mind. In the subacute cases the enlarged, swollen, and distended appendix can be frequently outlined by careful examination. As the periappendical tissues become involved and the quantity of infective material increases, the tumor becomes more pronounced and often attains considerable size. This is usually located in the right iliac fossa, but its absence from that position, with a clinical history indicating an appendicitis, must not be construed as meaning that the tumor is not present, because it will be found to be in the loin or low in the pelvis.

Fluctuation is only present when there is a large circumscribed abscess in the later stages of the disease. In the early stages of the disease the absence of peristalsis in the appendical region is of value in indicating the nature of the process. A careful examination with the stethoscope reveals a "still" area for many inches around the appendix.

The size of the tumor bears little relation to the quantity of pus. The area of infiltration around a streptococcus or staphylococcus infection is small, while the area of infiltration around the colon bacillus group of infections is always very large in proportion to the quantity of pus.

It is needless for me to go into details concerning the other minor corroborative signs of appendicitis, or to go into the many complications in the symptomatology of the later stages of the disease. The greatest difficulty is experienced in making a differential diagnosis between appendicitis and acute catarrhal conditions of the caput coli, or acute retention conditions in the caput coli, especially associated with the intestinal type of la grippe. Here we have the pain, nausea, and vomiting, the local sensitiveness and the elevation of temperature all combined, and so closely does it resemble appendicitis that in two cases I have erred in the diagnosis. In both there were evidences of previous attacks of appendicitis, with adhesions of the appendix, but in neither were there manifestations of an acute process in the appendix. Nor have my errors taught me a means of preventing their recurrence. I believe I

have avoided many errors in diagnosis by the stress which I placed on the order of symptoms as they occur, namely, pain, nausea and vomiting, local sensitiveness, and elevation of temperature; a deviation from this order causes me to seriously doubt the diagnosis of appendicitis.

Clinical Course. The clinical course of acute infective appendicitis is fairly uniform. In the acute infectious cases without calculus the mucosa becomes infiltrated and œdematous within an hour or two after inoculation. The œdema and infiltration increase rapidly and the compression of the inelastic coats of the appendix with the assistance of the biotic and toxic effects of the pathogenic flora produce a rapid gangrene of the mucosa, submucosa, and occasionally the entire thickness of the wall, with now and then complete gangrene of the appendix, so that a perforation of the appendical wall, on the average, takes place in from thirty-two to forty hours in virulent infections. Infection with the presence of a foreign body (fecal concretion) is usually associated with only a small area of gangrene, and that at the point of pressure of the calculus; here there is a local necrosis or gangrene with perforation and leakage; perforation in these cases takes place a little earlier than in the infections without a foreign body. Occasionally pressure ulceration and perforation of the appendix takes place at the seat of a coprolith without an acute infection. In this last class of cases the first announcement of the trouble is made by the initial symptoms of the perforation. These cases represent about 1 per cent. of all of the acute cases. It is a dangerous type for the patient, as the initial symptoms are attributed to a beginning appendicitis, when in reality they are due to a beginning perforative peritonitis.

In the streptococcus infections the mesoappendix and neighboring tissues are more seriously involved and the area of gangrene is less than with the colon bacillus or the staphylococcus types. The pain is most severe in the first six to fourteen hours; it becomes less as the necrosis advances; the temperature is highest from the sixteenth to the thirtieth hour, preceding the completion of the gangrenous process. If the gangrene continues to advance, the temperature remains up; if it becomes stationary, the temperature declines.

In one case of complete gangrene of the appendix the temperature was 104° nineteen hours after the onset of pain; it was 99.2° twenty-six hours after, at the time of operation. The appendix was gangrenous throughout its entire wall to its junction with the cæcum. It was a black, shining mass without an adhesion and slipped into the abdominal incision. The necrosis was so rapid and complete in this case that there was no effort on the wall of the appendix to fix itself to the neighboring tissues. I regard with alarm a sudden drop in the temperature and interpret it as meaning

a cessation of absorption, due, most commonly, to perforation of the wall of the appendix, with diminished pus pressure; second in frequency, to the escape of the contents of the appendix into the intestine; third, to gangrene of the wall; fourth, to circumscribing tissue infiltration with diminished absorption (local immunity); and, fifth, diminution of the virulence of the flora in accordance with the law of putrefaction and fermentation.

After fifty hours the clinical picture changes from that due to lesions of the appendix to that of infections of the periappendical regions. If the perforation takes place into the mesoappendix, or under circumscribing adhesions, the clinical presentations are those of a limited infection, while if the perforation takes place into the free peritoneal cavity the symptoms of a more or less severe peritonitis manifest themselves, depending upon the types of infection and the degree of involvement.

After a circumscribed abscess has formed, the temperature, pulse rate, and pain subside to a considerable degree; indeed, the temperature may approximate normal as the infiltration in the abscess wall becomes more and more pronounced and absorption proportionately diminished. If the rupture be into the postperitoneal cellular tissue, then there is rapid rise of temperature from the absorption. If the rupture be into the free peritoneal cavity, the rule is, first, a primary drop of temperature as the pus is relieved of pressure and the peritoneum has not yet been abraded of its endothelium, and therefore does not allow rapid absorption. In a staphylococcus infection of the milder type the peritoneum is first covered with an exudate, which may go on increasing in thickness to the formation of a membrane resembling the diphtheritic exudate. This exudate lessens the immediate absorption and protects the patient against an overdose of the septic products. It paralyzes peristalsis and produces coprostasis, but in a short time this plaque loosens, is thrown off, and carries with it the endothelial covering of the peritoneum, leaving a distinctly abraded or blistered surface from which there is rapid absorption and a sudden collapse of the patient, frequent bowel discharges, anxious expression, and shortly death. This sudden change in the staphylococcus infection of the peritoneum takes place between the evening of the fourth and the morning of the sixth day. If the primary infection of the appendix be of the streptococcus type and it ruptures into the peritoneum there is rapid blistering of the peritoneum and, within a few hours, symptoms of intense intoxication, high pulse, anxious expression, talkative delirium, quick perceptions, tympany, and all the manifestations of severe and acute streptococcus intoxication.

The action of the colon bacillus, when it gains entrance into the peritoneum, may be said to be midway between these two pictures. At times it produces but slight irritation, mild elevation

of temperature, considerable seropurulent exudate, and a gradually increasing disturbance of the surface of the endothelial covering of the peritoneum. The advancement is so slow that the tendency with this milder type is to circumscription of the process by peritoneal adhesions. On the other hand, under certain conditions, which we little understand, the colon bacillus may have a powerfully irritating effect on the peritoneum, produce rapid destruction of its lining cells, and expose its lymphatic stomata for rapid absorption. Indeed, its virulence may be so great as to produce gangrene of the peritoneum and even of the entire intestinal wall. This is fortunately rare, but is an extremely fatal type of the action of this bacillus. Sometimes the gas bacillus is associated with it and the tissue becomes emphysematous. There is not usually a high temperature in this class of cases, but great physical depression, lowered arterial tension, sunken eyes, somnolence, and finally low muttering delirium, differing entirely from the clinical picture of the streptococcus intoxication.

The quantity of pus found in the peritoneal cavity in the dry staphylococcus type is usually small. It may be large in quantity, and then it is of a seropurulent character. With the streptococcus type there is little, if any, free pus, but the peritoneum has that peculiar dry, granulating, blistered appearance which was so frequently seen in the post-partum sepsis of the pre-antiseptic period. The colon bacillus produces pus with an offensive odor, usually considerable in quantity and thick and creamy in character. The intestines are agglutinated together and many times separate pockets are formed. The elevation of temperature, the tympany, and the collapse are commonly slower in appearing with the colon bacillus than with either of the other types of infection. Collapse is not a sign of perforation, but a manifestation of the absorption of products of infection by an abraded or blistered peritoneum. It will appear rapidly or slowly after perforation, depending on the virulence of the infection and the rapidity with which the endothelium of the peritoneum is destroyed. This has been one of the most difficult lessons for the general profession to learn. For years we believed that collapse was an immediate manifestation of perforation; we must now recognize that it is a symptom of septic intoxication and always a late symptom, as far as the clinical course is concerned.

It can be seen from the various pathological conditions mentioned in the clinical course that a case of appendicitis may subside within a few hours by escape of the infective material along the tract of the appendix into the cæcum; that it may subside as a circumscribed inflammation of the appendix; that it may form a circumscribed infection without the production of pus in the free peritoneal cavity, with an inflammation only of the lymphatics of the mesoappendix and local peritoneum; that it may subside as a circumscribed

abscess outside the appendix, rupture through the wall of an adjacent coil of intestine, and empty itself in that way; that it may subside as a circumscribed peritoneal abscess and remain quiescent to be opened later; that it may terminate in a circumscribed or diffuse general suppurative peritonitis; that while it is a circumscribed abscess there may be a thrombophlebitis of the iliac veins, and the general venous circulation become infected with the manifestations of embolism, infarcts, and secondary abscess; that a portal venous branch may thrombose and hepatic abscess or pylephlebitis result; that there may be continuations of the infective process by contiguity of tissue or continuity of surface, extending down into the pelvis and up the opposite side of the abdomen, upward behind the peritoneum and around the kidney, upward beneath the surface of the liver and around the gall-bladder, or into the subphrenic space, through the diaphragm into the lung, and the pus be expelled through the mouth; or it may rupture into some portion of the urinary or genital tracts. All of these later and grave conditions are the sequences or the direct result of *omission* on the part of the surgical or medical attendants who had charge of the case during the first forty-eight hours of the appendicitis.

The closest attention has been paid in all of these cases to the relation between the symptoms and clinical course and the pathological findings, so that we may better anticipate the intra-abdominal changes by the symptoms and physical signs, or at least that we may know when and under what conditions pathological changes are not announced by appreciable symptoms, and thus avoid fatalities and surprises by a proper interpretation of the presence, order, or absence of symptoms.

I will not mention here the clinical course produced by the great variety of displacements, flexions, retentions, adhesions, torsions, and abnormal fixations of the appendix, as that would carry me beyond the scope of the paper. I must state, however, that we are just beginning to appreciate the great disturbance that can be produced in the intestinal tract and in the general metabolism, and the distressing and complex train of symptoms which result from these minor appendical lesions. We must operate much more frequently in the future for their relief than we have in the past, as we are learning from clinical experience that the disturbances produced by them are out of proportion to the logical deductions that could be made from the pathological conditions. The completeness of cures by operations on this class of cases is one of the most gratifying in the entire field of appendical surgery.

Time for Operative Intervention. The time for operative intervention may be divided into four stages: first, early, within the first forty-eight hours; second, in the active increasing inflammatory process, from the second to the fifth day; third, in the sub-

siding inflammatory process, from the fifth or seventh day on; and, fourth, in the intermediate stage—between attacks. From the previous statements concerning the clinical course and pathological changes, it can be seen that the most favorable time for operation is within the first forty-eight hours of the attack; or, from a pathological basis, before the perforation of the appendix or the infection of the periappendical tissue. The diagnosis can and should be made with accuracy in the great majority of cases before the end of the first twenty-four hours, and almost universally within the first forty-eight hours. From the symptoms and clinical course of the disease in the first forty-eight hours it is impossible to predict, with any degree of certainty, what the subsequent course of the case will be—that is, whether the tendency will be to subsidence and cure by natural processes or to a virulent, if not fatal, termination. This is the consensus of opinion of the large majority of those surgeons of greatest experience.

The danger of operative intervention in the early stage is scarcely more than that of an exploratory laparotomy. The time required for the convalescence is not more than two and a half to three weeks. Drainage is, as a rule, not indicated and hernia improbable. Unnecessary operations as a result of error in diagnosis would be very limited. The patient would, therefore, be relieved of his appendicitis without hazard, without prolonged illness, without the danger of unpleasant sequelæ, without the possibility of recurrence, by the only timely operation. To me there appears to be no excuse, no explanation, no logical process, no justifying hope that relieves the patient of the dangers of this disease. Procrastination, under these circumstances, I do not interpret as a manifestation of knowledge, experience, judgment, or true conservatism, but a stigma of their opposites. This should, therefore, be considered the period of election.

Should we operate in the second stage, during the increasing or spreading inflammatory process, which may mean anywhere from the second to the fifth day? In this stage we may have the circumscribed abscess around the appendix, the active inflammatory process of the neighboring tissues or organs, or the early pathological changes of a circumscribed or general peritonitis. We often find the temperature and pulse high, meteorismus, intestinal paralysis, and acute infected tissues, with manifestations of severe intoxication. These patients will not stand extensive manipulations. They are already fully burdened with the toxins, and this intoxication must not be increased or the patient will be sacrificed. Shall we operate? Yes, and in this stage. But the operation must be a limited one; that is, simple opening and relief of pus tension in the infected area with the removal of the appendix, if it be accessible and easily amputated. There should be the least possible separation of agglutinations or other trauma to the infected tissues. Agglu-

tinations and adhesions are life-saving, both in circumscribing the process and in rendering the local tissues unfit for absorption. Many of the fatalities in operations for appendicitis have been due to the failure of recognition of these facts. Where the patient is apparently overwhelmed with the intoxication from a circumscribed or diffuse peritonitis or inflammatory process, I content myself with making a simple incision in the abdomen and relieving the pus tension by the insertion of a large drainage tube without irrigation, without sponging, and without manipulation of the tissues. On the other hand, in the ascending stage of the disease, where the depression is not noticeable, when the intoxication is not severe, even when the quantity of pus is large, circumscribed or not circumscribed, the appendix is removed. In other words, the extent of operation is governed rather by the constitutional symptoms of the sepsis than by the extent or character of the pathological changes. One fact must never be lost sight of in operating on this class of cases, and that is, that the pus is usually virulent, and when organized adhesions are present they must not be separated, as they expose the surface to acute absorption. Organic adhesions are rarely formed before the fifth day. Exudates must not be rubbed nor torn off, as they carry with them the endothelia and leave an abraded absorbing surface. The peritoneum should be considered similar to the skin; in the latter, while the epithelia are intact, there is practically no absorption; they are the shingles of protection; with the peritoneum, while the endothelial cells are intact, there is practically no absorption. The rule, therefore, which I follow is not to treat any of the active inflammatory conditions on the expectant plan, but to relieve the suppurating infected centres by simply opening and inserting an efficient drain, and in the cases where the constitutional reaction is mild and the appendix accessible, it is removed. In my work the appendix has been removed in nine cases out of ten operated in the second stage, while if attempted in the 10 per cent. of selected cases, with severe symptoms of constitutional sepsis, the majority of them would be fatal. In the last two and a half years' work in general septic peritonitis I have had but one death following the operation, and that was a case of appendical origin, operated on the fifth day. The patient succumbed six days after the operation with a double pneumonia. The peritonitis had entirely subsided. This was the only death that occurred in any of the cases of peritonitis operated, including the typhoid, gastric, and intestinal perforations and sixteen consecutive cases of general suppurative peritonitis. The treatment after the operation in these cases consisted in placing the patients in a semisitting position, 35 to 45 degrees, retaining them in this position for three or four days, administering large quantities of saline solution (per rectum), from four to twelve quarts in twenty-four hours; the saline must be allowed to seep in, the tube remaining

constantly in position. No water was given by the mouth. The stomach never absorbs water, and under these conditions it does not readily transmit it to the intestines for absorption. Mild catharsis was induced with small doses of calomel, beginning eight hours after operation.

I am convinced that the great mortality which has been reported in operations in the second stage and under the clinical conditions mentioned above have, in a measure, been due to excessive manipulation, sponging, flushing, adhesion separating, and *prolonged operation*. The deaths in these cases of acute infection are due to the depression resulting from a sudden absorption of an overwhelming dose of toxin; this absorption is favored by the manipulations mentioned.

Let us contrast the treatment of an acute infective focus in the peritoneum with the treatment of a similar infection; for example, osteomyelitis in the ends of long bones. In the latter we open or tap without irrigation, sponging, curetting, or manipulation, and simply insert a drain. If we will treat the peritoneum with the same consideration we will have equally gratifying results. Water has no more license in the peritoneum than it has in the lung; the same may be said of trauma.

The posture after operation allows the pus to settle in the most dependent portion of the peritoneum; there it is pumped out through the tube by the alternating respiratory pressure. During transportation of cases of general suppurative peritonitis to the hospital the patients are kept in a sitting position; during operation they are kept in the same position. I do not consider any of these steps in the sense of life-saving stitches, but their combination and the results obtained have revolutionized my ideas and prognoses in general suppurative peritonitis, as well as in the acute and viciously septic appendicitis. Nor would I expect to cure a case of peritonitis in the stage of projectile, black vomitus; cold, clammy skin; pinched expression, ballooned abdomen, and dusky, cyanotic hue. Here, the fatal dose is already in the circulation, and inhibition, antitoxic eliminants, and hematodiluents would have no effect.

Operations in the third stage, or the stage of subsidence of the inflammatory process or retardation of the process of absorption, are not at all as urgent as in the first or second stage. To begin with, the destructive process has been overpowered by the local resistance of the tissue (the local immunity of tissue infiltration), and an effectual encapsulation has taken place; or they have been emptied through ulceration into a neighboring coil of intestine; or they are slowly destroying their boundaries in the line of least resistance and little absorption is taking place.

This process may continue for a considerable period of time unless some accident should rupture the wall, or the pus should come in contact with some vein and thrombophlebitis with embolism

ensue. The retained products of infection under these circumstances are always an element of danger, and in the hands of judicious and careful operators in this stage they can be conducted to the surface without hazard to the patient, and the appendix can, very frequently, be removed without extensive separation of adhesions or scattering the pus over non-infiltrated areas by carefully coffer-damming the operative field. If a mass is felt in the iliac fossa, pelvis, or loin, and is readily accessible in any of the positions, it should be opened directly over the most prominent point and drained. This, however, must always be the exceptional route. When a case has progressed to this stage, the patient is in a position to be placed in the best operative environment and to have the best skill. Personally, I open through the anterior abdominal wall in practically all of these cases and coffer-dam the field before opening the pus cavity. I have had six deaths in this class of cases, two in which the peritoneal cavity was not opened, but where the bulging abscess was simply opened and drained. In both of these the opening was made in the anterior abdominal wall without entering the free peritoneal cavity. Either from the preparatory manipulation or from pressure on the abscesses during operation they ruptured below into the free peritoneal cavity. Both were large abscesses, one in a fourteen-day and the other in an eleven-day case. The accident was not detected, as the pus flowed freely from the abscesses when they were incised. They died seventeen and twenty-six hours respectively after operation, from acute septic peritonitis. These cases occurred years ago, and since that time I never open directly into an abscess through an anterior incision. I always keep to the central side of the abscess and open into the free peritoneum, placing the coffer-dams before liberating the pus.

Three were operations in the third stage, with a secondary elevation of temperature and manifestations of absorption; two of these died from acute sapræmia from excessive separation of organized adhesions in efforts to remove the appendix in the presence of virulent pus. The other died from advancing gangrene with aërobic infection in which the intestines and local tissues sloughed. The sixth died of pylephlebitis with multiple hepatic abscesses. This I do not feel could be attributed to the operation, but to the fact that the operation was late and a thrombus had formed in the portal vein.

In the third stage the presence of pus is always an element of danger, and we should not feel content until it is removed.

In the fourth or intermediate stage the question arises, Should we operate on every patient who has been through an acute attack of appendicitis? If so, why? The reasons for operating that may be given are these: first, after an attack of appendicitis the patient is prone to recurrence; second, upward of 60 per cent. of the cases operated by me in the intermediate stage had had more than one

attack; third, in the large proportion of the cases in which there was only incision and drainage of the abscess (which was a procedure frequently recorded by me in my first three hundred cases) the attacks recurred. In one patient I drained a periappendical abscess on three different occasions, always with severe sepsis, before I succeeded in inducing the patient to come in between attacks to have the appendix removed; fourth, the pathological changes, such as adhesions, flexions, stenoses, etc., following a primary attack, very much favor a recurrence; fifth, even if there was no danger of recurrence of the inflammatory conditions, the adhesions, fixations, stenoses, flexions, and retentions in the appendix produce sufficient disturbance of the digestive tract to demand an operation for their prevention; sixth, recurrent infections are, practically, as dangerous as primary attacks (I recall one patient who died in the seventh attack); seventh, the appendix can be removed in the intermediate stage without danger. About two-thirds of the entire number of operations were in the so-called intermediate stage. In all of these I had one fatality and that was from an acute, infective peritonitis, traceable to an interne who had, without my knowledge, made a post-mortem on a post-abortion peritonitis the night before the operation; two other operations performed on the same day were similarly infected. I had one case of severe, but not fatal, hemorrhage, in the person of a physician, which was apparently due to penetration of the deep epigastric artery by the closing suture. This would mean about one death in 1300 or 1400 operations. In four of the intermediate cases only a stump of the appendix remained, as it was destroyed by the sloughing process. This is an extremely small number when one considers the severity of the inflammatory process and the number of cases in which the mucosa is gangrenous, as seen in the early operations. A partial or even complete obliteration of the lumen of the appendix is not rare.

THE TYPE OF OPERATION, as far as its application to many of the pathological conditions, has been mentioned from time to time in the progress of the paper. The routine incision is through the outer margin of the rectus, one-half inch to the central side of the linea semilunaris, rarely ever going through the transverse muscles or making the McArthur or McBurney incision. When the peritoneum is opened the finger is pressed down into the iliac muscles, drawn along the vessels upward until it hooks or lifts the ileum. This is followed out to the caput coli, the appendix located, freed, its mesentery compressed with heavy clamp forceps, and a catgut ligature placed in the crease. The mesentery is then divided, the base of the appendix is clamped with a heavy hæmostat, and a catgut ligature placed in the crease.

The appendix is then divided close to the ligature and embedded by two rows of fine linen sutures, always beginning on the mesoappendical line of the appendix; each row consists of three or four

continuous stitches; the stump is dropped. This is the procedure in the intermediate operation.

In the operations where infection is present, immediately after opening the abscess a coffer-dam, made of strips of gauze two and a half inches wide, is packed in on all sides of the infected area and retained there until the operation is completed. The abscess is then opened, the pus sponged out, the appendix located, if possible, and the adhesions gently liberated until a ligature can be placed upon the mesentery of the appendix. If the case be one of acute infection and virulent, as interpreted from the symptoms, a ligature is placed on the mesentery and one on the appendix, and both are amputated short, with no effort to embed the stump of the appendix. Notwithstanding the simplicity and this apparent imperfect closure of the appendix, I have not had a single case of fecal fistula requiring an operation for closure. In the septic peritonitis cases the appendix is always removed and a gauze and rubber drainage tube inserted, the latter going into the Douglas cul-de-sac or the vesico-rectal fold. A gauze drain alone in the presence of pus should never be relied on; the same is true of a cigarette drain. Where these are put in for the purpose of transmitting wound suction other than pus to the surface, they fulfil the intention for from eight to twenty hours after their insertion; then they become plugs, not drains. The most reliable and the safest drain is a rubber tube with small perforations. Portions of the coffer-dam around the field of operation may be permitted to remain for days after the operation. This is used less frequently now than it was years ago. The kind of drainage used is governed entirely by the character of the discharge. *All of the acute, severely infected cases are drained, even though the appendix has not perforated.* I consider that the area of the appendix and drainage makes me feel more secure. The drain, under these conditions, may be removed forty-eight to seventy-two hours after the operation. Dry sponges are always used and dry iodoform gauze coffer-dams. Irrigation is never resorted to in any of my abdominal work under any circumstances. The abdomen is closed with the layer sutures. A No. 2 dry catgut is used in the peritoneum, and so placed as to evert the cut edge of the peritoneum out into the abdominal wound and not expose it inside to form adhesions; a No. 4 is used in the aponeurosis of the rectus muscle and horse-hair for the skin. Occasionally a figure-of-8 silkworm-gut is used as an additional support in the aponeurosis of the rectus.

Immediately after the operation the patient is placed in a sitting position, 35 to 45 degrees, and kept there for from two to four days. This is not considered necessary in every case, but it is safer in most.

The Pathological Findings. It has been my endeavor to treat of the pathological findings in their relations to the symptoms or the stage of the disease, as well as the application of certain operative principles to definite pathological conditions. For a time it was my

practice to describe in detail what I expected to find in opening the abdomen, giving the pathological manifestations in detail. I must frankly confess that I have had many rude awakenings, although the average was fairly accurate. The errors, however, were so significant that had I changed from my rule of prompt action in every case, many lives would have been sacrificed. I was so impressed with these cases that the following expressions were used to the visiting physicians at the operating-table: "We do know from the clinical history, the symptoms, and physical signs that this is a case of appendicitis. We do not know what the tendency of the pathological process in this individual case is, whether it be toward security and repair or toward destruction and danger." A case in point: In a recent consultation, a surgeon of no small pretensions contended that the patient under consideration, then thirty-one hours after the onset of pain, whose pulse in the last six hours had fallen from 110 to 86, and whose temperature had fallen from 102.8° to 100.2°, was progressing favorably and operation might safely be postponed; but on the above rule it was insisted that no one could tell from these symptoms what pathological changes were taking place. The operation was accepted. The appendix was found free from adhesions, a circular gangrene one-half inch in length existed at about its middle, absorption had ceased, the line was clearly defined, and it is unnecessary to mention what would have been the result of delay. An early drop in temperature and pulse and cessation of pain cannot be relied upon as indication of a cessation of danger and must never be interpreted in that way. It only means a cessation of tension and absorption and not a subsidence of pathological changes or their subsequent dangers.

Subsequent Management of Cases. About 80 per cent. of the cases need very little, if any, special attention after the completion of the operation; 10 per cent. demand close watching and 10 per cent. the exercise of the greatest skill to conduct them to a favorable end, and it is to this last 10 per cent. that we will turn our attention. These are the ones that are already severely intoxicated, that have particularly septic processes, that have a local or general septic peritonitis. After the pus tension has been relieved by the opening and drainage and the source of the infection (the appendix) removed, the patient is placed in bed in the sitting (Fowler) position, with a back rest. This favors the settling of the peritoneal and wound exudates into the pelvis to the site of the drainage tube; it is a physiological fact that the pelvic peritoneum absorbs more slowly than the peritoneum above the umbilicus, and, furthermore, that encapsulation is favored by the anatomical structures in the pelvis and the activity of the omentum, sigmoid, and small intestines.

Then attention must be turned to elimination of the products

of infection. This is accomplished, first, by administering large quantities of fluids, rarely intravenous, occasionally subdermally, practically always per rectum and rarely by the stomach. Since we have learned that the stomach does not absorb water, and that in peritoneal inflammations and sepsis it does not readily force the water into the intestine for absorption, we have a good physiological basis for ceasing to give water by the stomach and good physiological explanation for the regurgitation of water administered by the stomach. We know from extensive clinical experience that very great quantities, one pint an hour, may be absorbed by the large intestine. The large quantity of water admitted into the circulation favors osmosis, dilutes the toxins, favors elimination, quiets thirst, lessens nausea, increases peristalsis and expulsion of gases. It is a matter of opinion through which of these channels we derive the greatest benefits. The stubborn fact remains, however, that the patient's comfort is greater, the condition improves, and they get well. Strychnine may have some value as supplementing the proctoclysis. If alcoholics are given at all they should be given by mouth, as they are rapidly absorbed by the stomach. Nuclein and unguentum Credé are beneficial in special cases, the former when the local resistance of the tissues seems to be meagre, the latter in the streptococcic types of infection with its exhilarative nerve phenomena. Calomel should be administered in small and repeated doses until effectual.

Immediate Results. The immediate results, if taken by hundreds, have varied very materially. The greatest mortality was in the first 100 cases, when it reached 11, and I might also add that in that 100 cases practically every one was an acute infection with pus perforation, more or less peritonitis, etc.; they embraced the cases from March 2, 1889, to July 23, 1893.

The number of deaths in each 100 then gradually decreased until after the meeting of the American Medical Association at Atlanta in May, 1896. It will be recalled that at that meeting there was a great cry against peritoneal operations and particularly against the frequent operations for appendicitis. This was heralded through the journals, and the general practitioner, believing it represented the consensus of opinion of the majority of surgeons, who were in close contact with the public, or general practitioners, accepted it as a fact and hesitated before advising operations when the unquestioned symptoms of appendicitis were present. The price in lives was great. The arguments urged represented the ideas of men who conducted large clinics, and not in close contact with the people or with the every-day practitioner, who saw mostly intermediate cases and did not realize the virulence, rapidity of destruction and danger, as well as the consequent vital importance of prompt and early action in the acute infective stage. In the year following this meeting the mortality reached 7 in 100. Then

there was another gradual decline, as the error of the position was recognized, until a second epidemic of so-called conservatism ("expectant treatment") passed over the country and carried with it its quota of deaths, when the mortality reached 6 in 100. For the last four years there has been a steady decline in the number until in the last 100 operations there was a mortality of 2 per cent. One of these deaths was due to an ileus of the small intestine high up, bearing no relation either in adhesions or otherwise to the appendical operation, and the other a death from a double pneumonia six days after the operation for general septic peritonitis of appendical origin, the peritonitis having entirely subsided.

It seems to me that every death from appendicitis is chargeable directly to the people, either for not calling in the physician sufficiently early after the onset of symptoms, or to the physician and surgeon for not acting promptly when they are called. I am sorry to admit that the latter represents the greater percentage. We should have no deaths from appendicitis, but *we are having them.* We should accept the force of numbers and experience to guide us against the culpable if not criminal error of delay in this class of cases. It is not necessary that every physician should lose a case so he may learn the lesson, any more than a doctor should lose a case under chloroform anæsthesia before he learns either to abandon it or have it administered by competent hands.

Final Results. The final results in appendicitis, as a whole, are very gratifying. When a patient has had the appendix removed, the rule is that he recovers from the operation, has as good if not better health than he had before, and is free from pain and inconvenience in the right hypochondriac region or disturbance of his digestive tract as a result of the disease or the operation. It is surprising how completely extensive adhesions, the result of diffuse and extensive inflammatory processes, disappear soon after the focus of infection is removed and the source of irritation eradicated. Prolonged packing and drainage tend to the formation of more firm adhesions than usually result from the inflammatory processes with their adhesions in limiting the infective process. With the exception of the adhesions following tuberculosis in the peritoneum, there is no other lesion in which the adhesions so rapidly and completely disappear as those that exist around an inflamed appendix. If the appendix has perforated and a secondary perforation has taken place into the intestine, a firm and organic adhesion of the appendix may remain, uniting it to the intestine, the caput coli, or the ileum, as the case may be. It seems to me even these rapidly absorb, so that in an abdomen where six weeks previous an operation had been performed for the drainage of a large periappendical abscess, with extensive suppuration and adhesions, almost every evidence of the disease, except a fluffy, velvety condition of the peritoneum, had disappeared. This is an every-day observation.

The regenerative power of the epithelium over the intestine is vast in the average case. Occasionally we find a tendency to keloid formations in the peritoneum, or to the formation of cord-like adhesions which develop into strong, firm bands of sufficient power to lift the patient from the table. Fortunately these are rare. If the appendix remains and becomes a chronic source of irritation after an attack of appendicitis, the adhesions often continue and remain there as a protection against a subsequent attack, rendering the danger in a subsequent attack less in these cases. If we could only tell from the symptoms that they existed, what a comfort it would be in recurrences!

HERNIA. Much has been written on the subject of hernia following the operation for appendicitis, and many suggestions have been made concerning the original incision. It seems that one of two incisions should be adopted: either the gridiron incision of McBurney and McArthur, or the incision through the rectus muscle. The gridiron incision has the advantage of retaining the muscle fibres without injury while it divides the muscular sheath, which is often strong, at the point of separation of the fibres. It has the disadvantage of confining the operator to a comparatively small field after the abdomen is opened, unless he is willing to sacrifice the muscle by division. This is not such a serious matter as we formerly believed. Muscle fibres may be divided in a direct transverse line if they are again brought into apposition and the full strength of the muscle retained. This is seen in division of the biceps, triceps, and the abdominal rectus. It leaves a depression and a deformity, but no deficiency in support. The other incision is one to the central side of the linea semilunaris, going through the rectus muscle. It has the advantage of permitting the incision to be elongated from the symphysis to the costal arch without the division of muscle fibres. It has the further advantage of permitting the peritoneal and the muscular aponeurosis to be sutured without including the muscle fibres and, at the same time, produces approximation of the slit muscular fibres side to side in their long axis, the sutures being applied in layers. The accurate apposition of the aponeurosis of the rectus with a catgut or figure-of-8 suture practically guarantees against a hernia. In the class of cases in which drainage is necessary there is a defect in the approximation of the aponeurosis of the rectus or of the muscle fibres if the gridiron incision be made, which leaves a weakness in the wall; this, in a considerable percentage of cases, results in hernia. Prolonged drainage is not so frequently necessary as was formerly supposed. A figure-of-8 suture, to be tied later, can be used for the approximation of the cut edges of the aponeurosis at this point. It should be allowed to remain loose until the drainage is removed, and then it may be drawn taut and good apposition secured, which will lessen the likelihood of hernia, though it will not prevent an

occasional one. If the postoperative hernia is tending to increase, it should be closed with an edge-to-edge union of the aponeurosis, or a flap operation of the aponeurosis, after the method of Mayo for umbilical hernia. Hernia bears close relation to drainage in all locations of incision in the abdominal wall.

Obligations of the General Practitioner. My early experience with appendicitis occurred when I was doing general practice, the first operation having been performed at Cook County Hospital on March 2, 1889, which I believe was the first one in this country under the new idea of the surgical treatment of appendical and perityphlitic affections or induration—*i. e.*, operating in the absence of phlegmon, but on the theory that the primary lesion was an infection and suppuration in the appendix and the perityphlitis, a secondary extension of this infection. Periappendical abscesses with phlegmon and induration had been drained and earlier intervention urged in most forceful language by Bull and others preceding that time. (The report of this operation was made to the Chicago Medical Society, November 4, 1889.) This operation was performed after reading the able paper of Krufft, which I think did more to stimulate early operations on the appendix at that time than any other paper that appeared. Therefore, I make no apology for speaking of the obligations of the general practitioner in appendicitis. In a large number of the early cases of appendicitis I was the first doctor called, and after a few experiences, which were so forceful in their instruction, it required no courage on my part to insist on the operation. Many of the first hundred operations were performed on the kitchen-table, with the ordinary aseptic conditions that could be secured in a twenty-minute or half-hour preparation. In a large number of them there was no trained nurse, no cumbersome excessive surgical paraphernalia, avoiding the loss of time which these entailed, hastening the liberation of the pus or the removal of the appendix, as the case might be. The facts gleaned at that time made me realize, as no subsequent experience has, the degree of destruction that can occur in a very limited number of hours with virulent infection of the appendix. Indeed, I was frequently asked, "Where do you get all of the appendicitis cases?" with a look and an inflection that did not indicate the utmost confidence in my diagnostic ability or the integrity of the numerals; but that is ancient history. Appendicitis has come and it has come to stay, and the responsibility of its immediate recognition is on the general practitioner. It seems to me that a man has no more right to hope that an inflammation of the appendix, once instituted, will tend to a favorable termination than he has to hope that an acute, infective osteomyelitis of the femur, or a phlegmon of the thigh, will recover without liberation of the pus.

Can the general practitioner make an early and accurate diagnosis? Yes. This is admitted by all at the present time. Is he

justified in hoping that the case will subside and go through to a favorable termination? No! We will admit that 80 per cent. of the cases recover from the attack; that 20 per cent., approximately, of the cases either die in the first attack or have recurrences. If he decides to wait, it is with the understanding that he is willing to sacrifice that percentage of his patients. All aid can as readily be timely as untimely. It seems to me that as a general practitioner I would feel personally responsible for the death of a patient suffering from a typical attack of acute appendicitis, if I had the case from the beginning and was called early—that is, in the primary pain. I might endeavor to ease my conscience by urging certain reasons for withholding action, or by stating that I was following Smith's or Brown's or Jones' plan of treatment, but the ever-living witness of inner judgment would be crying out against me. There is no plan of treatment which controls the pathological processes. There is no plan of medical treatment which materially lessens the risk. There is no system of beating the mortality percentages in appendicitis.

I wish to express my high appreciation of the strong position taken by many of the ablest medical men in insisting that they have no power of control over the disease, and that it is essentially from its initiation a surgical condition. Indeed, these men outrank many of the surgeons in their judgment and in their appreciation of the urgency of immediate action.

Obligations of the Surgeon. The obligation of the surgeon is to conduct a case of appendicitis to a favorable termination *with the least hazard or risk to the patient*, regardless of his personal or professional feeling or of the praise or condemnation of his conduct. We all meet cases where we would readily shirk the responsibility of action, but we have no license in the role of surgeons if we take that position. We all meet cases in which we would prefer to have one clean operation and be through with the case, but that must never be done where it involves additional hazard to the patient. A second operation with a living patient at the end is better than a primary radical operation with a mortality of two or three in a hundred as the price. This involves the element of individual judgment and cannot be adequately described. The man who is having more than three or four deaths in a hundred operations for appendicitis is either receiving his patronage from incompetent and procrastinating medical men, or he is doing too much manipulating in the peritoneal cavity under unfavorable pathological conditions. There are practitioners who recognize the earliest symptoms, and, indeed, I recall one who forced me on two occasions to operate where I was not satisfied of the diagnosis, and on each occasion he was correct.

The transportation of patients after the onset of an attack of appendicitis is an important factor, and one that comes under the

class of surgeon's obligations. If the case is brought to my attention before the thirtieth hour I feel that the patient can be transported to the hospital with safety. If, on the other hand, it is after that time it is safer to have the operation performed in the environment of his home, whatever that home may mean. If the patients are to be transported, they should be kept in the sitting position on the stretcher. Once the surgeon has operated he is obligated for all of the details of the case to a complete convalescence. If the associate is sufficiently competent to care for the patient under his instruction, well and good; otherwise he must see to it himself that all of the details are carried out to a complete and perfect convalescence.

PSEUDOMELANOSIS OF THE HÆMOLYMPH GLANDS.

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The writer's contention that lymphoid structures containing sinuses filled with red blood cells and showing evidences of extensive phagocytic hæmolysis are constantly present in the human retroperitoneal tissues has been widely accepted during the last two years. His statement that the hæmolytic activity of these organs is relatively greater than that of the spleen has been recently confirmed by Lewis,[1] who made comparative counts of the number of phagocytes containing red cells and pigment occurring in equal fields of the spleen and hæmolymph nodes. A number of organs were cut and several sections from each examined. In each section as many isolated fields as possible were taken with a $\frac{1}{6}$ objective, and the number of phagocytes containing red cells or pigment particles in each field were counted. Estimates were also made of the number of red cells enclosed within the phagocytes. From the results of these observations a few examples may be taken: In the case of the rat the proportion of phagocytes in the spleen was 1.6 to 93 approximately in the hæmolymph nodes; in the rabbit 1.2 in the spleen to 60 in the hæmolymph nodes; in the sheep 0.5 in the spleen to 31 in the hæmolymph nodes. In all cases the hæmolymph nodes showed by far the greatest amount of phagocytosis per average field.

Similar results have been obtained by the writer, and the suggestion made by him in 1902 that these nodes might properly be styled "hæmolytic glands" acquires additional force. Further confirmation of the marked hæmolytic activity occurring in these glands is shown by the striking and very interesting findings in the

[1] Journal of Anatomy and Physiology, vol. xxxviii,

following three cases occurring in the autopsy service of the University Hospital.

CASE I.—Miss K. C., aged twenty-six years. Right tube and ovary removed by vaginal route; operation followed by diphtheritic vaginitis, gangrene of the vaginal wound, and general fibrinous peritonitis. Autopsy five hours after death: abdomen slightly distended; small patches of dark-gray to greenish-gray discoloration over the abdomen and the upper parts of the thighs; at these areas of discoloration there is a well-marked subcutaneous emphysema. (Both the discoloration and emphysema were present before death, but increased to some extent during the five hours between that event and the autopsy.) On opening the body a strong odor of H_2S was perceptible, particularly in the abdominal cavity. Gas-bubbles were present in the blood of the large veins and heart. The cut surface of the lungs gave a strong odor of H_2S. No discoloration of the thoracic organs. The peritoneal exudate and the intestines presented no discoloration. Red blood clots were found in the pelvis. The spleen was bluish red, and showed no trace of pseudomelanotic discoloration. The edges of the vaginal wound were blackened and friable. Section of the dark patches in the subcutaneous tissue of the abdominal wall and thighs showed blackened areas containing gas-bubbles, but no macroscopic evidences of tissue disintegration. The odor of H_2S was distinctly perceptible immediately upon cutting into these patches, but was soon lost.

Hæmolymph Nodes. On exposing the retroperitoneal region there were visible in the prevertebral tissues, at the sides and behind the great vessels, about forty-five grayish to black glands occupying the usual site of the hæmolymph glands. The tissues about the dark glands showed no trace of discoloration, so that the latter stood out in sharp contrast to the light color of the former. Whitish and pinkish glands were found side by side with the dark ones. The majority of the discolored nodes were oval or bean-shaped, or flattened. They varied in length from 1 to 3 cm. and in diameter 0.5 to 1 cm. On section the dark discoloration of some appeared uniform throughout the gland; in others the discoloration was most marked in stripes and spots corresponding to the sinuses. The entire retroperitoneal tissues were dissected out and put into the first Kaiserling solution (formaldehyde, 200 c.c.; water, 1000 c.c.; potassium nitrate, 15 grams; potassium acetate, 30 grams). In twelve hours the dark color had become replaced by a light grayish, and after running the tissue through the three solutions all trace of discoloration had disappeared and the glands had become of a brownish-red color.

The microscopic examination of some of the dark glands fixed in mercuric chloride showed them to be hæmolymph nodes showing an increased number of phagocytes containing a brownish, granular

pigment which responded to the iron test with potassium ferrocyanide and HCl acid. No bacteria were seen in the pigmented glands. Sections of the edges of the vaginal wound showed an organizing fibrinous exudate containing blood-pigment and numerous colonies of bacilli. No sections were made of the dark areas in the subcutaneous tissues of the thigh.

The bacteriological examination resulted in the obtaining of pure cultures of colon bacilli from the heart blood and the peritoneal exudate.

CASE II.—Mr. G. H., aged forty-two years. Transverse myelitis (fracture of fourth and fifth cervical vertebræ); decubitus; chronic cystitis and pyelonephritis; chronic purulent bronchitis and bronchiectasis; general marasmus. Autopsy eleven hours after death: abdomen on level of ribs; large bed-sore on sacrum, having edges gray to black in color; small amount of clear fluid in peritoneal cavity; no peritonitis; no odor of H_2S in either thorax or abdomen; no discoloration of spleen, intestines, or other abdominal organs. On removing the intestines and mesentery and exposing the retroperitoneal tissues, an exactly similar picture to that seen in Case I. was found. Along and behind the abdominal aorta and vena cava were forty to forty-five dark-gray to black glands standing out distinctly in the light fat and connective tissues. Glands of pale and pink color were found side by side with the dark ones. The right psoas was pale and soft; the left one was very soft and of the same color as the dark glands. No odor of H_2S could be perceived.

An attempt was again made to make a gross museum specimen of the retroperitoneal tissues by the Kaiserling method, with the same results as in the first case. The dark-gray or black color quickly disappeared from the glands, and in alcohol the latter became red or brownish red.

The microscopic examination showed the dark glands to be hæmolymph glands containing an increased number of pigmented phagocytes. With potassium ferrocyanide and HCl acid the greater part of the pigment gave the iron reaction. No bacteria were found in the glands. In the liver the cells of the central portions of the lobules contained a large amount of a yellowish-brown pigment which did not give the iron reaction. Numerous phagocytes containing iron were found in the spleen.

The bacteriological examination of material taken from the bed-sores yielded five saprophytic organisms not fully identified. Staphylococcus aureus was obtained from the bronchial pus.

CASE III.—Mrs. R. Operation for removal of ovarian carcinoma followed by abscess of abdominal wall and beginning peritonitis; patient died suddenly of acute cardiac dilatation. Autopsy three hours after death; strong odor of H_2S in peritoneal cavity and in abscess of abdominal wall; no discoloration of peritoneum, peritoneal exudate, or of abdominal organs; wall of abscess gray-

ish; no odor of H_2S perceived in lungs or heart; retroperitoneal hæmolymph nodes enlarged, apparently hyperplastic, about forty in number, and of a dark-gray color, standing out very prominently in the light adipose tissue; pink and whitish glands were found in association with the discolored ones; no odor of H_2S in retroperitoneal tissues. The prevertebral tissues were dissected out and put into the first Kaiserling solution, in which the gray color gradually changed to a brown, becoming reddish when put into alcohol.

The microscopic examination of the hæmolymph nodes showed them to be hyperplastic, the sinuses filled with phagocytes containing blood pigment. Numerous hyaline areas staining red with acid fuchsin were found throughout the lymphoid tissue of the nodes. With potassium ferrocyanide and HCl the iron reaction was obtained with the greater part of the pigment in the phagocytes, and fine granules of hæmosiderin were also found in the hyaline areas. No hæmosiderin was found in the liver, but it was presept in large amount in the spleen.

The bacteriological examination resulted in the isolation of a bacillus belonging to the colon group from the pus of the abscess in the abdominal wall and from the peritoneal exudate. No other organism found.

Summary. The striking feature possessed in common by these three cases is the grayish or black discoloration of the retroperitoneal hæmolymph nodes in the absence of any similar discoloration of the spleen or other abdominal organs. The occurrence of such discoloration can hardly be explained otherwise than as due to a combination of H_2S and the iron-containing blood pigment found in the phagocytes present in the sinuses of the affected nodes. As to the source of the H_2S, it is evident in all three cases that the gas was formed, not in the intestinal canal, but in local infected foci or in the blood. In the first case there was a general colon bacillus infection arising from the infected seat of operation in the vagina and pelvis. Throughout the entire body there was a strong odor of H_2S. In the second case there was a saprophytic infection of the bed-sore, with secondary involvement of the left psoas. Though no odor of H_2S could be perceived in this case, there can hardly be any doubt that the discoloration was due to its presence. In the third case there was a strong odor of the gas in the peritoneal cavity and abdominal abscess, and from these regions a bacillus belonging to the colon group was isolated. Each case therefore presents an adequate source of origin for the gas and a definite cause for its formation, and in two of the cases its presence was evident through the strong odor.

It is probable (certain in one case) that the formation of H_2S began before death, and that the appearances presented by the hæmolymph nodes were not wholly the result of post-mortem changes and conditions. It is of minor importance, however,

whether the gas was formed before or after death. The important point is the fact that in the hæmolymph nodes there may be such a quantity of iron-containing pigment that these nodes may take up H_2S and become grayish or black in color, while the spleen remains unchanged in appearance.

Such a phenomenon may be explained by the fact that the gas does not gain entrance into the spleen pulp as readily as into the hæmolymph nodes, or that the amount of iron-containing blood pigment is greater in these nodes than in the spleen, or that the iron-containing pigment in the hæmolymph nodes combines more readily with H_2S than does that in the spleen. On comparing sections of spleen and hæmolymph nodes tested for iron with potassium ferrocyanide and HCl acid, the amount of iron-containing pigment in the hæmolymph nodes is relatively much greater than in the spleen. Nevertheless, in two of the cases numerous phagocytes containing iron were present in the spleen, although this organ at autopsy showed no trace of discoloration. The other two factors must therefore be considered as possible.

That the combination of the H_2S with the iron pigment is very loose is shown by the rapid disappearance of the black discoloration in all the usual fixing fluids. A similar change took place more slowly on simple exposure to the air. In the case of the Kaiserling method the black color was replaced by the normal red or reddish-brown color of the hæmolymph nodes. The gas is therefore probably given off very readily from its combination with the iron pigment.

The combination of H_2S with the iron-containing blood pigment of the nodes seems to be a satisfactory explanation for the pseudomelanosis in these three cases. The theory advanced by Borst,[1] that the discoloration of pseudomelanosis may in some cases be due to a reduction of iron pigment to metallic iron, receives no support in the findings of these cases. The view of Ernst,[2] that local pseudomelanosis is due to a local growth of hydrogen-sulphide-forming bacteria, applies in part to these cases. The discoloration of the edge of the vaginal wound and the black patches containing gas in the skin of Case I., the discoloration of the bed-sore and psoas muscle in Case II., and the discoloration of the abscess wall in Case III. were undoubtedly due to the local growth of bacteria producing H_2S and the combination of the gas with blood-pigment resulting from local extravasations. It is doubtful, however, if such an explanation will hold good for the origin of the pseudomelanosis of the hæmolymph nodes, inasmuch as no bacteria could be demonstrated microscopically in these. In the first case there was most probably a colon bacteriæmia, the bacillus being obtained in a pure culture from the heart's blood; so that it is prob-

[1] Virchow's Archiv, Bd. cxlvii.

[2] Ibid., Bd. cliii.

able that colon bacilli were present, to some extent at least, in the sinuses of the hæmolymph nodes. Taking everything into consideration, it seems most probable that the pseudomelanosis of the hæmolymph nodes in all three cases was due to an absorption of H_2S from the blood or through the tissues rather than to a local formation of gas in the sinuses of these organs.

Such a localization of pseudomelanosis as described above has not, to my knowledge, been previously recorded. This is, however, not of so great importance as the strong additional proof offered of the marked hæmolytic activity of the hæmolymph nodes.

NOTE.—The exposure to H_2S of hæmolymph nodes obtained from cattle and sheep produced results exactly like the findings in the above cases. The nodes quickly became discolored; some becoming uniformly grayish black or brownish black, others becoming spotted or streaked. The discoloration thus produced lasted for a longer time than that seen in the autopsy cases.

A STUDY OF THE TUBERCLE BACILLI ISOLATED FROM THREE CASES OF TUBERCULOSIS OF THE MESENTERIC LYMPH NODES.[1]

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THE desirability of studying tubercle bacilli from those cases of tuberculosis which are presumably the result of food infection was emphasized by me[2] in 1898 as the surest way of gaining an insight into the relation between bovine and human tuberculosis. In a more recent contribution[3] I described among other cultures two from the mesenteric glands of children, one of which (Human XI.) was pronounced to be of bovine origin. At the same time I supplemented the studies made by Ravenel upon a presumably bovine culture (BB) from a child by applying a new reaction test there described for the first time. This latter culture had also the characteristics belonging to the bovine bacillus.

I shall not attempt to review certain articles which have appeared since the conclusion of the manuscript of my former communication in May, 1903, since they do not bear directly upon the contents of this paper, but simply begin with the statement that no observations have thus far been presented which invalidate the distinction between

[1] Read before the Association of American Physicians, May, 1904.
[2] Journal of Experimental Medicine, 1898, vol. iii. p. 451.
[3] Transactions of the Association of American Physicians, 1903, vol. xviii. pp. 109–151.

the bovine and the human race or variety of tubercle bacilli made by me in 1898. This distinction, as I then clearly stated, does not imply that the bovine bacilli, under certain conditions, might not invade the human subject.

In the following pages three cultures, all of them from the mesenteric lymph nodes of human beings, are studied from those points of view best adapted to inform us whether they are of the bovine or of the human variety.

Human Culture XIII.

For the material from which this culture was isolated I am indebted to Prof. Mallory and to Dr. H. A. Christian, who performed the autopsy, from the protocol of which extracts are given below.

The case was that of an infant, eight months old, in the service of Dr. T. M. Rotch, at the Children's Hospital, Boston, Massachusetts. The clinical history may be very briefly summarized:

About three months before admission the child began to have swelling of glands on the left side of neck and face. These have been opened, but they have recurred again and again. There has been coryza for two months, which has interfered with nursing. The lesion of the neck was incised, the pus pressed out and proper treatment instituted. There was no positive reaction from two injections of tuberculin given on the seventh and the ninth days. The child died on the fourteenth day after admission. The autopsy, performed fifty-four hours post-mortem, brought out the following pathological conditions:

"There was pneumonia in both lungs, but no evidence of tuberculosis in any of the organs of the thorax.

"In the abdomen the mesenteric lymph nodes are enlarged, and many of them soft and cheesy. In the spleen there are miliary tubercles.

"In the ileum, close to the ileocæcal valve, there is a small yellowish nodule which projects slightly into the lumen of the intestine. The mucous membrane over this is intact, and the size of the nodule does not exceed 4 mm. In the ascending colon there is a somewhat similar lesion a little larger and over the surface of which the mucosa is slightly ulcerated and somewhat pigmented. With the exception of these two lesions the intestinal tract was normal.

"Liver, weight 310 grams. The surface is a pale tawny pink, and scattered over it are numerous nodules, from 3 to 5 mm. in diameter, which are lighter in color. Some of these project considerably above the surface of the liver, others project but slightly. Just at the periphery of each there is a slight depression in the liver, giving the areas a somewhat button-like appearance. On the cut surface these nodules are yellowish or grayish in color, and many of them can be made out to be formed of smaller coalesced areas of similar character. On the surface of the liver some similar

nodules are seen always near the surface, and, as a rule, extending to the surface of the liver. In the tissue about some of the bloodvessels a few small grayish points, probably miliary tubercles, can be made out.

"Throughout the meninges can be seen a few generally widely separated and very small, grayish areas. In a few places these become much more numerous and more closely set. This is particularly true of the adjacent surface of the posterior portion of the longitudinal fissure and the superior median surface of the cerebellum. This is also true of the surface of the island of Reil, in which, on both sides, there is a conglomerate tubercle fully 1 cm. in diameter, firm, of a yellowish color, and closely adherent to the surface of the cortex, though apparently not embedded in it. Over the base of the brain, particularly along the surface of the medulla, pons, and basal ganglia, there is a moderate amount of yellowish fibrinous exudate. This is also present over the anterior portions of the temporal lobes, and here appears to have a more purulent character."

The anatomical diagnosis includes tuberculous, exudative, and miliary meningitis, conglomerate tubercle in the island of Reil on both sides, tuberculous nodules in intestine, caseous tuberculosis of mesenteric lymph nodes, conglomerate tuberculosis of liver, and miliary tuberculosis of spleen.

The culture was obtained from one of the mesenteric lymph nodes. These were about 1 cm. in diameter, centrally soft, caseous. In several smears tubercle bacilli were not found. A dense suspension of caseous material in normal salt solution was injected into the abdomen of three guinea-pigs. Cultures were obtained on dog serum, horse serum, or egg medium from all of the guinea-pigs. The growth and appearance in all the tubes indicated identity. In all cases the development was prompt and vigorous, indicative of the human race bacilli. The growths became heavy, coalescing, smooth or wrinkled membranes. In some cases well-isolated, smooth, roundish colonies were obtained. Good growth on glycerin agar followed the inoculation of subcultures. In the earliest cultures the bacilli appeared as solid rods, of somewhat variable length, measuring from 1 to 2.2μ in length. In somewhat later cultures they were so irregular and polymorphic in outline that measurement was impossible. The preliminary inoculation of guinea-pigs with tissue had already indicated bacilli of a low degree of virulence. The subsequent tests upon rabbits and guinea-pigs with definite suspensions of pure cultures confirmed the early inference. In Table I. the result of tests upon rabbits, in Table II. those on guinea-pigs are given. In both species marked resistance to this bacillus is manifest.

That it is not an attenuated or modified bovine culture is made evident by the culture reactions given in Table III. For the sake of

comparison a bovine culture was included in each group of cultures. In all three tests the difference between the bovine and the human races is in evidence.

Human Culture XIV.

This bacillus was isolated from material obtained through professor Mallory. The patient, a Chinaman, aged twenty-six years, was admitted to the Boston City Hospital suffering from nausea and pain in the stomach. Physical examination revealed nothing unusual.

During his stay in the hospital the temperature fluctuated between normal and 104° F. Rales developed in both lungs, which gradually increased in intensity, although no definite consolidation could be detected. The patient died on the sixteenth day after admission, after a gradual failure of heart and respiration. From the autopsy protocol of Dr. Mallory the following points are of interest to us:

In the peritoneal cavity "surfaces smooth and shiny, with no increase in fluids. Mesenteric lymph nodes much enlarged. One of the glands measured 2 cm. diameter; glands were confluent. On section there was revealed a yellowish, cream-cheese-like substance; a smear from the same reveals B. tuberculosis.

"*Pleural Cavity.* Left lung bound everywhere by rather strong fibrous adhesions. On separating the costal and parietal pleura many minute, grayish, raised areas are seen.

"*Lungs.* Dark-red, hubbly surface, non-crepitant throughout, except for a few subcrepitant areas at the apices. On section surface is dark red, rather dry, and scattered everywhere are grayish-white areas, averaging 2 to 3 mm. in diameter, discrete, often confluent. Bronchial lymph nodes not enlarged. Bronchi filled with mucopurulent material.

"*Kidneys.* Scattered throughout cortex and in pyramidal region are a number of yellowish-gray areas not raised above the surface, averaging 2 mm. diamater, discrete for most part, occasionally confluent."

The anatomical diagnosis included miliary tuberculosis of the lungs and kidneys, tuberculosis of the mesenteric lymph nodes, and acute tubercular pleuritis. In this case the evidence obtained from the post-mortem examination suggested primary tuberculosis of the mesenteric glands which furnished the infection for the fatal miliary tuberculosis.

The source of the culture studied was a mesenteric lymph node about as large as a horse-chestnut. It was almost wholly converted into a soft caseous mass. In several smears bacilli were not detected. The isolation was made as in the preceding case, by injecting a suspension of the cheesy matter into the peritoneal cavity of

three guinea-pigs. The disease in the guinea-pigs was so slight that they all greatly increased in weight during the six weeks following the inoculation. In one, chloroformed after ten weeks, no lesions could be found and no cultures were attempted. In the remaining two the lesions were characteristic, though slight, and nearly all cultures made developed rich crops of colonies, isolated and confluent. Only the cultures from one guinea-pig were tested on animals and in bouillon cultures for the reaction curve.

The bacilli were slightly curved rods, 1.5 to 2.5μ long, the greater number being about 2μ in length. Cultivation on glycerin agar, glycerinized potato, and horse serum yielded cultures quite vigorous, although they did not equal in richness those on dog serum.

One rabbit (Table I.) which received twice the standard dose was chloroformed after one month because suffering with snuffles or rhinitis. The lesions found were very slight. The second rabbit, which received the usual dose, was also affected very slightly. The guinea-pig receiving the usual dose had but slight lesions after fifty-eight days. The one receiving twice the usual dose died in eighteen days.

[redacted] Human Culture XV.

The material from which this culture was isolated was sent to me by Dr. Warfield T. Longcope, of Philadelphia, at the suggestion of Dr. Simon Flexner. The case was that of a negro cook, aged thirty-nine, admitted to the Pennsylvania Hospital April 26, 1903. He had been taken ill with cough about two weeks before admission. Of the results of the clinical examination only the following points need be mentioned: Fine crepitations and rhonchi over the lungs; heavy precipitate of albumin in the urine; sputum free from tubercle bacilli. Death ensued on the eighth day. During the disease the temperature was elevated and irregular, ranging from 101° to 104° F.

The following abstract of the autopsy protocol was kindly forwarded to me by Dr. Longcope:

Anatomical Diagnosis. Acute disseminated miliary tuberculosis, caseation of mesenteric lymph glands, tuberculosis of lateral ventricles of brain, tuberculosis of thoracic duct, acute splenic tumor, cloudy swelling of liver and kidneys, acute aortic endocarditis.

Peritoneal cavity normal. Pleural surface covered with miliary tubercles. Pericardium normal.

Heart. On two of the cusps of aortic valves there are several delicate gray and yellow granular vegetations which are distributed along the point of closure of the valves beneath the vela. The aortic as well as the other valves are thin and delicate. No other marked changes in heart.

Lungs. Slight chronic fibrous pleurisy; pleura everywhere sanded with minute miliary tubercles. On section the cut surface of both lungs is seeded with small gray and yellow tubercles. Very few exceed pin-head in size, but some in upper lobe of left lung are caseous, and are 2 to 4 mm. in diameter. There are no cavities, old scarred areas, or evidence of chronic tuberculosis.

Spleen. Weight, 170 grams. It is filled with miliary tubercles.

Liver. Cut section seeded with fine pin-point gray tubercles.

Kidneys. Many tubercles scattered over capsule and cut sections. They are gray and yellow, and measure from 2 to 3 mm. in diameter.

Pelvis and ureters normal. No lesions found in stomach, *intestines,* urinary bladder, prostate, seminal vesicles, or testes.

Mesenteric glands average 2 to 3 cm. in diameter. Most of them are either entirely caseous or contain large areas of caseation. Retroperitoneal glands are enlarged, but show no caseation. Thoracic duct thickened throughout. Near the receptaculum chyli the lumen is partly filled with soft caseous material. The walls of the duct are everywhere studded with gray or yellow tubercles.

In this case, as in the preceding one, the evidence that the tubercle bacilli entered by way of the intestines was pretty definite, and hence an effort was made to isolate the bacillus. The material sent to me was a piece of lung tissue. It contained, besides many tubercle bacilli, a variety of other bacteria. Three guinea-pigs receiving intraperitoneal injections of salt solution in which the lung tissue had been torn up died within twelve hours. An effort was next made to remove the miscellaneous bacteria by washing the remaining tissue repeatedly in sterile salt solution. After this treatment stained preparations of the tissue showed only a very large number of tubercle bacilli. These were either straight or slightly bent rods fully 4μ long. A few were fragmented.

A second lot of guinea-pigs were inoculated with the washed tissue, two into subcutaneous pockets with bits of tissue, a third with a suspension into the peritoneal cavity. All remained alive until chloroformed after twenty-five or thirty-five days. The disease ran a mild course, and when chloroformed all the guinea-pigs had gained considerably in weight. Successful cultures were obtained from each guinea-pig. The bacilli grew in the form of large isolated or confluent colonies of a smooth, glistening appearance on dog's serum. Subcultures on glycerin agar and in glycerin bouillon were readily obtained, and after several generations the appearance of the cultures differed nowise from the human type of bacilli.

In form they varied in length from 1 to 3 μ, the greater number being 1.5 to 2 μ long, slightly curved.

TABLE I.—RABBITS. (All inoculations are into an ear vein.)

Designation of culture.	Total age of culture.	No. of transfer.	Age of culture used.	Dose in c.c.[1]	No. of rabbit.	Date of inoculation.	Initial weight (grams)	Final weight (grams)	Result.	Remarks.
Human XIII.	28 days.	Second	10 days	1.00	104	Apr. 25, 1903	2970	2992	Chloroformed after 2 months.	Very fat; foci in kidneys; barely visible tubercles in liver; lungs free.
" XIII.	28 "	Second	10 "	0.5	171	Apr. 25, 1903	1648	1870	Chloroformed after 2 months.	A few foci in kidneys; some minute tubercles in lungs.
" XIV.	35 "	Second	9 "	1.00	138	May 2, 1903	2548	1995	Chloroformed after 1 month.	Because of discharge from nostrils ("snuffles"); considerable number of small tubercles in kidneys; a few minute tubercles in lungs.
" XIV.	35 "	Second	9 "	0.5	172	May 2, 1903	1625	1540	Chloroformed after 54 days.	Many foci in kidneys; none in lungs; tubercles in iris of both eyes.
" XVa.	3 months 18 days.	Fourth	10 "	0.75	132	Oct. 3, 1903	1990	2455	Chloroformed after 3 mos. 12 days.	Moderate number of foci in kidneys; none in lungs.
" XVc.	3 months 8 days.	Third	10 "	0.4	180	Oct. 3, 1903	1975	2245	Chloroformed after 2 mos. 4 days.	A very few gray tubercles in kidneys and lungs.

[1] The suspension in normal salt solution is, as heretofore, equivalent in density to a twenty-four-hour bouillon culture of typhoid bacilli after removal of clumps by sedimentation. Dog serum was the culture medium.

TABLE II.—GUINEA-PIGS. (All inoculations are intra-abdominal.)

Designation of culture.	Total age of culture.	No. of transfer.	Age of culture used.	Date of inoculation.	Dose in c.c.	Initial weight (grams)	Final weight (grams)	Result.	Remarks.
Human XIII.	28 days	Second	10 days	Apr. 25, 1903	1.00	319	234	Died in 52 dys.	Lymph nodes not affected; spleen large; no visible tubercles in lungs, liver, and spleen.
" XIII.	28 "	Second	10 "	Apr. 25, 1903	0.5	301	260	Died in 48 dys.	Like preceding.
" XIV.	35 "	Second	9 "	May 2, 1903	1.00	375	300	Died in 18 dys.	Multiple necrotic foci in liver; spleen large; lungs not affected; lymph nodes barely so.
" XIV.	35 "	Second	9 "	May 2, 1903	0.5	379	325	Chloroformed in 58 days.	Spleen large; no visible tubercles in any organ, except on testicles.
" XVa.	3 mos. 18 dys.	Fourth	10 "	Oct. 3, 1903	0.5	397	....	Died in 50 dys.	Lungs filled with tubercles; liver and large spleen free.
" XVc.	3 mos. 8 dys.	Third	10 "	Oct 3, 1903	0.5	410	270	Died in 18 dys.	Hyperplasia of omentum; multiple necrosis in liver; lungs compressed by effusion; no visible tubercles; pregnancy discovered after inoculation.

TABLE III.

Composition of bouillon.	Designation of culture.	Date of inoculation.	Reaction of bouillon in per cent. of a normal solution after (— = acid, + = alkaline).
No. 1111.[1] One per cent. Witte peptone; three per cent. glycerin. Reaction —2.05. Moderate amount of muscle sugar.	Bovine VIII.	May 8, 1903	35 days = —1.05; 48 days = —0.75; 81 days = —0.6.
	Human XII.	" 8, "	35 " = —1.65; 48 " = —1.6 ; 81 days = —2.1.
	" XIII.	" 8, "	35 " = —1.65; 81 " = —1.45.
	" XIV.	" 8, "	35 " = —1.6 ; 81 " = —1.65.
	" XVa.	Sept. 29, "[2]	49 " = —1.3 ; 85 " = —1.6.
No. 1182. Same composition as above. Reaction = —1.8. Trace of muscle sugar only.	Bovine VIII.	June 22, 1903	71 days = —0.3 ; 94 days = —0.15.
	Human XII.	" 22, "	71 " = —1.7 ; 94 " = —2.25.
	" XIII.	" 22, "	71 " = —1.15; 94 " = —1.00.
	" XIV.	" 22, "	71 " = —1.8 ; 94 " = —2.1.
	" XVa.	Sept. 29, "[2]	63 " = —1.2 ; 89 " = —1.6.
No. 1153. As above. Reaction = —1.8. Slight amount of muscle sugar.	Bovine VIII.	Sept. 18, 1903	31 days = —0.25; 60 days = —0.0 ; 96 days = —0.0.
	Human XIII.	" 29, "	30 " = —0.8 ; 62 " = —6.5 ; 86 " = —0.75.
	" XIV.	" 18, "	60 " = —0.85; 99 " = —1.65.
	" XVa.	" 18, "	53 " = —1.00; 85 " = —2.35; 99 " = —2.45.
	" XVc.	" 29, "	31 " = —1.00; 63 " = —2.5 ; 89 " = —2.85.

[1] This lot of bouillon was unfavorable for some unknown reason, for the membrane of the various cultures remained comparatively feeble. This probably accounts for the cessation of growth of Bovine VIII. before approaching the zero point

[2] These flasks were more or less concentrated by evaporation at the date of inoculation.

For the virulence and culture tests two strains from two different guinea-pigs, denominated respectively XVa. and XVc., were saved. The effect of this tubercle bacillus in pure culture, even in twice the doses usually given, was that of a highly attenuated type, as shown in Tables I. and II. It will be noticed that one guinea-pig was pregnant at the time of inoculation. This condition, unknown at the time, was probably the cause of the early death as compared with the mate inoculated with the other strain of bacilli. The second animal lived a long time in spite of the fact that the inoculation was intra-abdominal.

In the rabbits the disease was very mild and the lesions limited to a few foci in the kidneys of both and a few translucent tubercles in the lungs of one. The one receiving 1½ times the standard dose gained nearly 500 grams in three months.

The Reaction Test in Glycerin Bouillon.

In a preceding paper[1] the writer called attention to the difference in the movement of the reaction of the glycerin bouillon in which bovine and human bacilli are multiplying. In the case of the bovine cultures this movement leads to a final reaction, either neutral, feebly alkaline, or feebly acid, toward phenolphthalein; in case of the human cultures to a pronounced acidity to phenolphthalein. In the latter the reaction at first becomes less acid, then either much more acid, or else it remains at a medium level. Concerning various precautionary details in applying this test to cultures, the reader is referred to the earlier paper.

In Table III. the tests made with the three new cultures are given in detail. Three different lots of glycerin bouillon were tried, and for controls two older cultures, Bovine VIII. and Human XII., were studied side by side with the new ones.

The first lot of glycerin bouillon, No. 1111, was, for some unknown reason, opposed to a very active growth of the bacilli. The membranes remained thin and smooth, and as a result the alkali production in Bovine VIII. was feeble and inhibited after a time. This case, the first I have encountered, suggests caution in interpreting results until several lots of bouillon have been tried.

The titrations yielded results which agree essentially with those tabulated in the preceding paper. The reaction of the bovine culture in the three lots of bouillon moves gradually to the phenolphthalein neutral point. The human cultures pursue one of two courses. They either attain a greater than the initial acidity after two or three months (Human XII., XIV., XVa. and XVc) after having become less acid, or else, as in Culture XIII., the reaction remains after some preliminary fluctuation at a medium level of acidity.

[1] Transactions of Association of American Physicians, 1908, vol. xviii. pp. 109–151.

These changes in reaction have already been discussed and referred to glycerin as the cause. Further investigations on this subject are now in progress.

Summary.

The bacilli isolated from these three cases of presumable food infection do not correspond to the bovine type of bacilli in any one particular.

1. They were readily cultivated from nearly all the guinea-pigs inoculated, and they grew luxuriantly from the start on dog's serum. Subcultures on glycerin agar and glycerin bouillon grew vigorously after the first transfer from dog's serum.

2. Morphologically the bacilli were either fairly long—*i. e.*, they averaged about 2μ in length, or else they were very variable, polymorphic. The uniformly short, straight forms of the bovine type were absent.

3. In all cases the bacilli were of a very low order of virulence, lower even than that of many of the cultures of human origin studied heretofore.

4. None presented the reaction curve of true bovine bacilli.

We have, as yet, no satisfactory evidence concerning the degree of change, if any, which tubercle bacilli of bovine type may undergo in the human body. That changes could be as thoroughgoing as would be the case if we were inclined to attribute these cases of infection by way of the digestive tract to milk is at present quite inconceivable, and we must content ourselves by referring them to infection with bacilli of strictly human origin.

A STUDY OF CIRCUMSCRIBED AND DIFFUSE PULSATION OF THE WALL OF THE THORAX.

WITH THE REPORT OF A CASE OF PULSATING HÆMOTHORAX.

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Pulsation of the wall of the thorax is a physical sign varying so much in extent and degree that it is impossible to ascribe to it any general significance. Premising that it is invariably due to pulsation transmitted from the heart or large bloodvessels, with the exception of an apparent, not a real, pulsation due to rhythmical muscular contractions, the only classification that is possible is (1) pulsation without structural alteration in the walls of the thorax or in the tissues lying between the walls and the heart and bloodvessels, and (2) pulsations in which these structural changes exist and may be

supposed to be the transmitting agents. In the former group are included all those forms of pulsation due to increase in the activity of the heart, where this increase is due to structural alteration or functional conditions, such as increased muscular activity or irritability of the nerve supply. It is hardly necessary to speak of the former group; pulsation of the wall of the chest is common in cases of marked hypertrophy of the heart. It may be limited to the precordial region, or cause a general systolic shock in a large area of the wall of the chest, perhaps extending along the upper part of the abdomen. The systolic movement is often wave-like in character, appearing to follow the heart's contraction from the base toward the apex, and this wave often appears to continue beyond the apex, moving toward the abdominal wall. Sometimes the impulse is more distinct to the eye than the hand. It may reach its maximum intensity in the region of the apex of the heart, and not infrequently is associated with slight bulging of the precordium. The impulse that occurs after violent exertion or excitement is usually characterized by a general systolic shock involving the whole of the thorax, and sometimes causing a movement of the trunk and head. Pulsation, either localized or diffuse, may occur in thoracic aneurysms. These varieties are sufficiently familiar to be passed without further comment.

Another form of pulsation occurs the nature of which is not quite so clear. The following case was observed at my clinic at the Polyclinic Hospital:

L. J., a Russian Jew, aged twenty-six years. The heart was normal and not beating vigorously. There was distinct suprasternal pulsation; the abdominal aorta pulsated palpably and visibly; there was distinct negative pulsation in the veins of the shoulder, which were distended, but no diastolic pulse was present in the veins at the base of the neck. Pulsation of the liver could not be determined, and the organ was not enlarged below the border of the ribs. There were no signs of arteriosclerosis. *There was a distinct, though slight, systolic pulsation of the whole right side of the thorax.* This was not perceptible upon palpation, probably because it was too diffuse. The left side did not pulsate. There were no signs of pleural effusion on the right side. The pulmonary sounds were normal, and the percussion note was not impaired. The patient had a slight degree of gastroptosis.

In a somewhat similar case recently reported by Edwards, there was vigorous expansile pulsation on the left side near the base, which led to the suspicion of aneurysm of the aorta. At the autopsy the thoracic organs were found to be entirely normal, but the blood-vessels were atheromatous. A case has also been observed by La Fleur.

In the case I report I am led, for lack of any more satisfactory explanation, to suppose that the pulsation of the thorax was similar

to that observed in the abdomen, and was possibly due to the rather voluminous pulse not infrequently present in persons with long, narrow thoraces and ptoses of the organs.

Of the abnormal pulsations in the wall of the thorax, due to organic changes, perhaps the most common and important is the systolic retraction that may be associated with pericardial adhesions. The most pronounced form is that in which, in addition to the retraction of the apex, there is also retraction in the epigastrium and in the lower interspaces in the left posterior axillary line, known as Broadbent's sign. This sign is not uncommon. I have observed it in several cases, but upon only one of these could an autopsy be obtained. This case was as follows:

W. L., aged forty-two years, had had syphilis and rheumatism. He had known that he had heart trouble for five or six years. The area of cardiac dulness extended from the right parasternal line to the left anterior axillary line. There was a loud, harsh murmur at the apex, systolic in time, not heard at the base. There was pulsation in the veins of the neck, and a pulsating liver throughout the entire time of observation, which was three years. There was systolic retraction at the apex and epigastrium, and also in the eighth, ninth, tenth, and eleventh interspaces posteriorly. The latter was very distinct, and served on numerous occasions for the demonstration of Broadbent's sign.[1] A diagnosis was made of mitral and tricuspid regurgitation and obliterative pericarditis. At the autopsy the heart was found lying horizontally in the thorax, and extending from the right anterior axillary line to the left posterior axillary line. The left auricle was enormously dilated, being about as large as the rest of the heart. There was a buttonhole mitral valve, a greatly dilated tricuspid orifice, and obliterative pericarditis and pleuritis.

Next in importance are the cases in which effusion of air or liquid or both has taken place into the pleural cavity. This forms by far the most interesting group, and will, therefore, require more extended consideration. The condition has been known since the oft-quoted case of De Baillou, which was reported in 1640. It was evidently seen by others, and was fairly well known in the eighteenth century, if we may judge from the remarks in Le Roy's *Aphorisms*. The first case, however, that was ever reported with any degree of accuracy, according to Comby, is that of Bérard, which was published in 1810. Later, MacDonnell, independently

[1] Broadbent's patient was a girl of nineteen who had been sick for two months. She was brought to the hospital two days before her death, with signs of pleural effusion on the left side. The heart was displaced to the right, but there was visible and palpable pulsation from the fifth interspace in the left nipple line to the xiphoid cartilage, and also in the tenth interspace from the spine to beyond the angle of the scapula. An aneurysm or malignant tumor was suspected, but at the autopsy obliterative pericarditis with adhesions of the pericardium to the central tendon of the diaphragm and the chest wall was found. Broadbent suggested that the pulsation posteriorly was due to the tugging of the heart on the diaphragm.

and in ignorance of Bérard's work, published three interesting observations, and Stokes published one, reported most unsatisfactorily, and yet, on account of the extraordinary character of some of the symptoms, particularly noteworthy. A number of other cases were subsequently published, some complete, some merely mentioned incidentally in the course of the discussion of other conditions. Finally, in 1883, Comby, in addition to reporting three cases of his own, made a careful study of the literature and was able to collect twenty-seven cases all told. Four years later Keppler also reviewed the literature, reporting one case of his own, and collecting 38 cases. In 1888 Rummo reported 2 cases and reviewed the literature. In 1895 Comby published a small monograph in which he described 47 cases. In 1897 Fuchs reported an additional case, and was able to find 13 other cases not in Keppler's collection, bringing the number up to 52 cases. In the mean time, however, Wilson, of Philadelphia, in 1893, had reported 3 cases that had come under his observation, and had collected 65 cases from the literature, including those reported by Comby and Keppler. In 1900 Innocenti and Marsili reported 2 cases, and gave a careful review of the literature. Then, in 1903, Henry made a final report of his case, and added 15 cases not in Wilson's collection, making the total 80 cases. As far as I can discover, the total number of cases on record is 97, of which several are so incompletely reported that they are worthless for statistical purposes.

From a study of these cases we can recognize the following groups: (1) pulsating empyema and pulsating pyopneumothorax of necessity; (2) pulsating empyema and pulsating pyopneumothorax; (3) pulsating encapsulated empyema; (4) pulsating serous or hemorrhagic effusion; (5) pulsating extrapleural abscess.

The frequency of pulsations associated with various forms of pleural exudate is probably not great. Comby suspected that it was often overlooked, but after his excellent paper had called general attention to the subject the number of such cases reported was not very materially increased. Thus in Paris only four additional cases were observed in the period from 1882 to 1895. The condition may now be regarded as fairly well known. Several critical papers have been published in France by Comby; in Germany by Keppler and Fuchs; in America by Wilson and Henry; in Italy by Rummo and Innocenti and Marsili, and in England by West. Toft observed it in about 3 per cent. of his cases of empyema. Innocenti and Marsili estimate its frequency at 1 per cent. Many clinicians of large experience, as Millard, who have seen one case, and whose attention has been aroused, have not seen others, and other clinicians who have written about the subject, such as Rosenbach,[1]

[1] Diseases of the Bronchi, Lungs, and Pleura, edited by J. H. Musser, Philadelphia, 1902, p. 896.

von Leube[1] and West have never observed any cases. It may be assumed, therefore, that such pulsations are uncommon, and must be produced by some unusual condition or group of conditions. Although these conditions must occur more or less independently of the nature of the pleural exudate, nevertheless the phenomena produced vary considerably in the different forms, and I believe it will be advisable to consider them separately. Before doing this it is well to discuss the different varieties of pulsation that may occur.

It has been customary to divide the visible and palpable pulsations into those more or less diffuse in character and without tumor formation, and those in which a definite pulsating tumor occurs. Both may be present simultaneously in the same case. As the term "empyema of necessity" (pointing empyema) implies, tumors may appear in the wall of the thorax, and the pulsation may be limited strictly to them. It is, in fact, such tumors, often mistaken for aneurysm, that constituted the majority of the early reports of this condition, and gave rise to the belief, first expressed by Comby, that pulsation only occurs when the exudate is purulent. The pulsation in these tumors is systolic in time, that is to say, all observers, with the exception of MacDonnell and Stokes, state that it is synchronous with the contraction of the heart or with the pulse in the great vessels. MacDonnell states that in all his cases the pulsation was diastolic, but he does not say whether he compared it with the contraction of the heart or the pulsation of the radial artery, and it is improbable that in his cases it differed in character from that observed in the others. There is some question as to whether or not the pulsation is expansile. Ordinarily it is so described; but Duplay, who saw a case of Comby's in consultation, was able to demonstrate that it was not of the true expansile type observed in aneurysmal pulsation. Ordinarily the maximum pulsation is observed at the apex of the tumor, and not infrequently, when more than one tumor is present, one will pulsate and the other or others remain motionless. In some cases the pulsation does not develop *pari passu* with the tumor, but appears more or less suddenly sometime in its course, as in the case reported by Heyfelder. In other cases the pulsation is variously affected by different therapeutic measures that may be employed.

Rummo lays particular emphasis upon the difference between endopleural and exopleural pulsation. By the latter he means a pulsation that is visible and palpable externally, and by the former pulsation in a pleural exudate that can be detected only by instruments. For this purpose he used a hollow needle, a rubber tube, and a mercurial manometer, or, when the graphic method was employed, the tambour of a Marey sphygmograph. Then thrusting

[1] Diagnose der inneren Krankheiten, Leipzig, 1902, Bd. i. p. 175.

the needle into the pleural cavity he was able to get a tracing of the pulsation occurring in it. I have tried this three times, once in right-sided pleural effusion, and twice in left-sided pleural effusion, but have been unable to observe pulsation synchronous with the heart. I think it must be obvious that the distinction between the endopleural and exopleural pulsations is one rather of degree than of kind. If the endopleural pulsation becomes slightly stronger it will become exopleural without any change in the causative conditions. The classification of West, therefore, appears to be more satisfactory. He recognizes three forms: first, a general systolic shock over the thoracic wall, occurring in large effusions with much pressure; very much the same, he says, as the pulsation which may be transmitted through an intrathoracic tumor or the solid lung in pneumonia; second, a pulsation felt usually in front, which is due to the propagation through the fluid of a wave, and to relaxation of the walls of the thorax; third, an expansile type of pulsation which resembles the fluctuation observed in abscesses, and to produce which the surrounding portions must be rigid. The objection to West's classification is, I think, that it depends upon a hypothetical etiology. Clinically, I believe that a more satisfactory classification is as follows:

First. The diffuse pulsations of the thoracic walls. Of these there are two forms: first, a perceptible and palpable or merely palpable pulsation felt in one part of the thoracic wall. This gives a sensation not unlike that communicated by the wave that travels through an ascitic accumulation of fluid, but ordinarily not quite as distinct. In a case of chronic tuberculous empyema that I had an opportunity of observing in Dr. Allyn's wards at the Philadelphia Hospital I was able to demonstrate this form of pulsation to my class. It was felt from the eighth to the eleventh interspaces in the neighborhood of the posterior axillary line on the left side. It was not a pronounced pulsation and was not visible. The second form is a more powerful pulsation affecting the whole wall of the chest, visible and palpable, and even perceptible subjectively to the patient. The most remarkable case of this kind is that reported by Stokes, one of the earliest cases of pulsating pleurisy to become generally known. In this case the pulsation was so violent that it not only kept the patient awake at night, but even perceptibly shook the bed, and this in spite of the fact that the cardiac action was not greatly exaggerated. One of Béclère's cases exhibited the same form of pulsation.

Second. The circumscribed pulsations with tumor formation. These may be subdivided into four classes: first, cases of empyema or pyopneumothorax, in which, as a result of a local area of weakness, there is a bulging of the wall of the thorax where the pulsation occurs; second, the cases in which there has been perforation of the pleura, the pus from the empyema passing through the intercostal

muscles, and giving rise to a subcutaneous abscess communicating with the empyema by a fistula. In both these classes there may also be diffuse pulsation; third, localized bulging and pulsation as a result of encapsulation of fluid in the pleural space, whether the fluid is purulent or serous in character; fourth, the formation of an abscess entirely outside of the thoracic cavity, usually arising from the periosteum of the ribs or sternum, and ordinarily tubercular in nature. Such tumors are comparatively rare. I have already discussed and illustrated the non-pulsating form in a previous paper.[1] Unless perforation from without inward has occurred it is difficult to understand how the pulsation is produced.

Third. A true expansile pulsation of the whole thorax, of which the only certain case apparently is the one I record, that is probably due in part to factors other than the mere accumulation of fluid in the pleural cavity, the displacement of the viscera, and the altered tension of the walls.

Rather than give brief abstracts of all the reported cases—which has already been done satisfactorily in this country by Wilson and continued almost to date by Henry—it has seemed to me more useful to summarize the results in the form of statistics. In order, however, to avoid the imputation of including imaginary cases, most unjustly made of Wilson by Fuchs and Innocenti and Marsili, I shall give a list of the references of all the cases I have been able to collect, arranged chronologically. These are altogether ninety-seven. Two of these cases (Potain and West) are mentioned incidentally in the discussion, in one instance of pulsating empyema, in the other of thoracic aneurysm. No details whatever are given, and they are, therefore, not considered. It has been customary since Keppler's paper appeared to include the case of Geigel[2] in the group of pulsating empyemas. In his report, however, Geigel states that the tumor below the ribs on the right side gave a distinct sense of fluctuation, but says nothing of pulsation. The case, therefore, has been omitted.

Woillez[3] mentions cases observed by Koelpin and Govelle, but Comby has been unable to find the original records:

Baillou. Empyema of Necessity. Paris, 1640. Quoted by Comby.

Pelletan. Extrapleural Abscess. Clinique chirurgicale ou mémoires et observations de chirurgie clinique, Paris, 1810, tome iii. p. 254.

Bérard. Empyema of Necessity. Du diagnostic dans les maladies chirurgicales de ses sources et de ses incertitudes et de ses erreures, Paris, 1836.

MacDonnell 1. Pyopneumothorax with Tumor. 2. Empyema of Necessity. 3. Empyema of Necessity. Dublin Journal of Medical Sciences, 1844, p. 1.

Wintrich. 1. Empyema of Necessity. 2. Empyema of Necessity. Virchow's Handbuch der speciellen Pathologie u. Therapie, 1854, Bd. v. pp. 259–301.

Stokes. Empyema. Diseases of the Heart and Aorta, Dublin, 1854, p. 607; Philadelphia, p. 623.

[1] Philadelphia Medical Journal, April 5, 1902.

[2] Wurzburger med. Zeitschr., 1859, Bd. i.

[3] Traité clinique des maladies aiguës des organes respiratoires, Paris, 1872, p. 403.

Vidal. Mediastinal Abscess. Bull. de la Société anatomique, 1854, 29th year, p. 243.

Cruveilhier. Serous Effusion. Bull. de la Société anatomique, 1854, p. 244.

Asson. Empyema of Necessity. Giornale veneti di Scienze med., September, 1855.

Flint. Serous Effusion. Physical Exploration and Diagnosis of Diseases Affecting the Respiratory Organs, Philadelphia, 1856, p. 581.

Heyfelder. 1. Empyema of Necessity. 2. Circumscribed Pleural Abscess. Zeit. f. praktische Heilkunde, November, 1858, p. 860.

Aran. Empyema of Necessity. Gazette des hôpitaux, November, 1858, No. 108, p. 91.

Rees. Empyema of Necessity. British Medical Journal, August 21, 1858.

Wilks. Empyema of Necessity. Lancet, November 12, 1859, p. 481.

Baly. Serous Effusion. Lancet, November 12, 1859, p. 482.

Wiltshire (Chandler). Empyema of Necessity. Lancet, May 31, 1862, p. 573.

Chambers (Ash). Empyema of Necessity. Lancet, May 31, 1862, p. 573.

Lesage. Circumscribed Empyème (Empyème pulsatil à répétition). Gazette des hôpitaux, October 31, 1865, p. 511.

Chvostek. 1. Empyema of Necessity. 2. Empyema of Necessity. 3. Empyema of Necessity. Wiener med. Blätte, 1865, p. 115.

Reyher. Periosteal Abscess. Berl. klin. Woch., 1868, p. 426.

Courbon (Le Double). Empyema of Necessity. Gazette des hôpitaux, May 24, 1870, p. 237.

Toft. 1. Empyema of Necessity. 2. Empyema of Necessity. 3. Empyema. Nord. med. Arkiv, 1871, Bd. iii., No. 7.

Walshe.[1] 1. Empyema. 2. Empyema. Practical Treatise of Diseases of the Lungs and Heart, 4th edition, 1871, p. 296.

Kemp. Empyema. Quoted by Walshe.

Traube. 1. Doubtful. 2. Empyema. Berl. klin. Woch., 1872, No. 7.

Shattuck. Empyema. International Clinics, January, 1872, p. 87.

Plagge. Empyema of Necessity. Beiträge z. Kenntniss d. pulsirenden Thoraxgeswulste. Memorabilien, 1872, No. 11, p. 481.

Müller. Empyema of Necessity. Berl. klin. Woch., January 22, 1872, p. 37.

Fraentzel. Empyema. Ziemssen's Handbuch, 1874–75, Bd. iv. 2d half, p. 301.

Lorenzutti. Empyema of Necessity. Annali universali di medicina e di chirurgia. Milano, 1875, vol. ccxxxii. p. 385.

Topham. Intrathoracic Abscess. Lancet, 1878, p. 756.

Dunin. Doubtful. Gazetta Lekarska. Quoted by Comby.

Brünniche. Extrapleural Abscess Communicating with Empyema. Hospitalstidende, 2 R., Bd. ix. p. 65; Virchow-Hirsch Jahresberichte, II., 1882, Bd. x. p. 146.

Comby. 1. Empyema. 2. Empyema. 3. Empyema. 4. Empyème (case of Duguet). Arch. générale de médecine, 1882, p. 549; l'empyème pulsatile, Paris, 1895.

Yeo. Empyema of Necessity. Lancet, February 23, 1884, p. 331.

Dillingham. Empyema. New York Medical Record, March 8, 1884.

Féréol. Pyopneumothorax. Proc. de l'acad. de médecine, 1884, No. 7, p. 155.

Broadbent. Serous effusion. Lancet, May 31, 1884, p. 971.

Pel. Circumscribed Empyema. Berl. klin. Woch., February 25, 1884, p. 113.

Ross. Circumscribed Empyema. Canadian Medical and Surgical Journal, May, 1885, p. 606.

Henry. Pyopneumothorax with Tumor. Proceedings of the Philadelphia County Medical Society, 1885, vol. iii.; New York Medical Journal, May, 1903.

Florand. Empyema. La France médicale, 1886, p. 158.

Codivilli. Empyema of Necessity. Thesis, Bologna, 1886, No. 97. Quoted by Rummo.

Cammareri. Empyema of Necessity. Gazetta degli Ospedali, 1886, No. 97, p. 772.

McCosh. Empyema of Necessity. Medical Record, January 30, 1887, p. 156.

Keppler. Circumscribed Pleural Effusion. Deutsche Archiv f. klinische Medicin, 1887, p. 220.

Borgiotti. Pyopneumothorax. Clin. med. in Bollet. de Soc. Cult. d. Scienzi Siena, 1886–87, p. 91.

Rummo. 1. Empyema. 2. Empyema. Riforma Medica, 1888, p. 1304.

Martinez. Seropneumothorax. Quoted by Rummo.

Millard. Empyema of Necessity. Gazette hebdom. d. méd. et de chirur., 7–12, 1899, p. 447.

Osler. Serous Effusion. The American Journal of the Medical Sciences, January 1889, p. 43.

Martin. Pyopneumothorax with Tumor. Revue méd. de la Suisse Romande, 1889, No. 2.

Bimmerman. Empyema. Geneeskundig Tydschrift voor Nederlandsch Indië, 1889, Bd. xviii. Quoted by Henry.

[1] Walshe states that he has seen six cases altogether.

Monari. Empyema of Necessity. Gaz. degli Ospedali, August 6, 1890, No. 63, p. 498

Light. 1. Empyema of Necessity. 2. Empyema of Necessity. 3. Empyema of Necessity. Lancet, September 26, 1891, vol. ii. p. 704.

Wilson. 1. Pyopneumothorax with Tumor. 2. Empyema. 3. Pyopneumothorax. Transactions of the Association of American Physicians, Philadelphia, 1893, vol. viii.; Medical News, July 15, 1893.

Pittorelli. Empyema. Gaz. degli Ospedali, 1893, vol. xiv. p. 1260.

Watkins. Pyopneumothorax. Lancet, January 21, 1893, p. 133.

Osler. Pyopneumothorax. Transactions of the Association of American Physicians, 1893, p. 210. Discussion of Wilson's paper.

Potain. Extrapleural Abscess. Médecine moderne, November 29, 1893.

Béclère. 1. (Marieux) Empyema. 2. (Béclère's) Empyema. Bull. et mém. de la Société. médicale des hôpitaux de Paris, 1894, tome xi. p. 339; tome xii. p 42.

Proust. Empyema. Ibid., 1894, p. 339.

James. Empyema of Necessity. International Clinics, 1895, vol. ii. p. 5.

Toulmin. Empyema of Necessity. University Medical Magazine, 1895, vol. vii. p. 853.

Roux. Empyema. La Province médicale, Lyon, 1896, tome x. p. 100.

Lepine. Serous Effusion. Lyon médicale, 1896, No. 8, tome lxxxi.; Centralbl. f. innere Med., 1897, p. 765.

Fuchs. Pyopneumothorax. Zeitschr. f. klinische Medicin, 1897, 32 Suppl. Hft., p. 255.

Sallés. 1. Pyopneumothorax. 2. Pyopneumothorax. La Province médicale, 1897, tome xi. p. 337. Quoted by Henry.

Cavazzani. Extrapleural Abscess. Gaz. degli Ospedali, 1897, vol. xii. p. 781.

West. Extrapleural Abscess. Medical Chirurgical Transactions, 1897, vol. lxxx. p. 239.

Innocenti and Marsili. 1. Empyema. 2. Hæmopyothorax. Riforma Medica, 1900, No. 261, p. 423.

Auerbach. Serous Effusion. Münchener med. Wochs., 1901, p. 1228.

McPhedran. Serohemorrhagic Effusion. Transactions of the Association of American Physicians, 1903, p. 334.

Kullman. Serous Effusion. Deut. med. Woch., 1904, p. 339.

Stanton. Empyema of Necessity. Unpublished. Read before the Medical Section of the College of Physicians of Philadelphia, 1904.

Sailer. Hæmothorax.

The attempt to classify the cases is only partially successful, but the following list appears to be approximately correct:

Cases of	empyema of necessity, that is, with tumor formation	34
"	pyopneumothorax with tumor formation	4
"	empyema without tumor formation	25
"	pyopneumothorax without tumor formation	8
"	serous or hemorrhagic effusion	12
"	circumscribed empyema	5
"	extrapleural abscess	5
"	uncertain nature	2

Properly speaking, then, we have of the cases with pus in the pleural cavity, 38 with tumor and 33 without tumor. There were 13 cases of intrapleural or extrapleural abscess, and the remaining cases were either non-purulent or their nature not definitely known. It is not at all impossible that some of the cases of supposed serous pleurisy may have been purulent. This is particularly true of the case reported by Flint, and it is certain that in one case (Keppler's) the fluid, which was clear at the time of the first puncture, subsequently became purulent.

Of the 95 cases, 63 were males 19 females, and in 13 the sex is not given. There are, therefore, nearly three and one-half times as many males as females. Twelve patients were under twelve years of age; 10 between the ages of ten and twenty; 32 between twenty

and thirty; 14 between thirty and forty; 6 between forty and fifty; and 3 between fifty and sixty. In 18 the age is not given. Practically 90 per cent. of the cases occurred before the age of forty, and nearly 70 per cent. before the age of thirty. Pulsation of the wall of the thorax may therefore be regarded as distinctly a condition of early life. The youngest case (Light) was three years, the oldest (Cavazzani) was fifty-six years.

The only interest in the result of these cases is in determining whether pulsation increases the gravity of the prognosis or not. Of the 95 cases, 37 recovered, 27 died, 16 were improved (probably in many cases only temporarily), and in 20 the result is not stated, either because the report was made while the patient was still under observation, because the patient withdrew from observation, or because the case was mentioned incidentally with reference only to the pulsation. Therefore, the mortality of the cases whose termination is definitely known is 46.7 per cent. The following table shows the results for the different forms:

	Recovered.	Died.	Improved.	Not stated.
Empyema with tumor	11	10	6	7
Empyema without tumor	6	8	4	7
Pyopneumothorax with tumor	1	3	0	0
Pyopneumothorax without tumor	2	1	4	1
Serous effusion	4	3	2	3
Circumscribed empyema	3	1	1	0
Extrapleural abscess	3	2	0	0

It is hardly worth while to note the manner in which the cases were treated. Operations were performed upon 69 cases, and in 6 of these spontaneous rupture also occurred. Spontaneous rupture into the lung occurred three times, into the œsophagus once, and externally six times. No treatment was employed in 6 cases, and in 11 the reports do not furnish any information. The operations included practically all the operations for empyema: aspiration, drainage, or resection of one or more ribs. In the case of Bérard the patient punctured the supposed aneurysm with a needle. Topham's patient was kept in bed for three years before spontaneous rupture occurred. The majority of cases that recovered had persistent deformity, but in a few cases the thorax resumed its normal shape.

The position of the heart is of some interest. It is stated that it was displaced to the right in 53 cases, in all of which the lesion was on the left side. In 31 left-sided cases its position is not mentioned, but often it is obvious that it must have been displaced. In 3 right-sided cases its position was not mentioned. In 1 right-sided case (Borgiotti) it was displaced to the left. The degree of displacement varied considerably. In the case of Wiltshire it was very slightly displaced, but in many of the other cases the apex beat was in the right nipple line, or even beyond that point. It is definitely stated that it was not displaced in 9 cases (Stokes, Vidal, Reyher, Béclère,

Light, Cavazzani, Innocenti and Marsili, Sailer, and McPhedran). Two of these (Vidal and Reyher) were extrapleural abscesses; one (Cavazzani) was apparently a circumscribed empyema. In one (McPhedran) exopericardial adhesions were suspected, but not demonstrated, and in a very remarkable case (Béclère) there was a funnel-shaped thorax extending 3½ cm. inward which prevented the displacement of the heart. For 3 cases (Stokes, Light, and Innocenti and Marsili) no reasons are given, and in the eighth case (Sailer) exopericardial and endopericardial adhesions were found at the autopsy. In the 3 cases reported by Toft, hinderances to the dislocation of the heart, in the form of adhesions or effusion on the right side, existed.

The causes assigned are various, and probably often incorrect. Tuberculosis—in all probability the commonest cause—is mentioned only eleven times, and in only two instances, apparently, confirmed in inoculations (Rummo, Béclère). Acute pleuritis of undetermined nature preceded the condition fifteen times. Chronic pleurisy occurred twice. Pneumonia of some form, with pleurisy or abscess, occurred in 13 cases. There were 4 cases in which an acute illness preceded the empyema. There was 1 case of pertussis. Pleural effusion is said to have been present once. Pneumothorax had apparently been present in one case before the empyema, but had disappeared before the pulsation was observed. Severe injury to the side occurred in 5 cases, exposure twice. In one remarkable instance (Fuchs) there was an attempt at abortion, followed by salpingitis, subdiaphragmatic abscess rupturing through the diaphragm and empyema. A few special cases cannot be grouped. In the case of Courbon there had been dyspnœa and palpitation for four years, with boring pain in the lumbar region. In a case of Innocenti and Marsili, which developed in a man aged forty-three years, there had been pleurisy, with a large effusion at the age of twenty-five. In the case of Martinez carcinoma was present. For some other cases there are merely indefinite statements, such as "pain in the side," "cough," which may indicate an undiscovered pleurisy or pleural effusion, or perhaps pulmonary tuberculosis, and for the rest no etiological factor is mentioned.

The most important part of our knowledge of these conditions is obtained from the records of the autopsies. I will, therefore, give brief abstracts of the post-mortem findings in the 21 cases in which autopsy was performed.

1. MacDonnell: The left lung was collapsed and bound firmly to the chest wall by adhesions; it was tuberculous. The pericardium was adherent to the right lung.

2. MacDonnell: The lungs were tuberculous and contained a large abscess cavity. The fifth and sixth ribs were eroded.

3. Vidal: There was pus in both pleural cavities, and a small pocket back of the sternum, the same size as the tumor and com-

municating with it through a hole. Both these pockets contained thick, creamy pus, and neither communicated with the pleura.

4. Heyfelder: Caries of the second, third, seventh, and eighth ribs; rupture of the pleura, and external empyema. The liver was displaced downward. There was no trace of tuberculosis.

5. Rees: The left side of the chest was retracted; the left lung was compressed and tuberculous; there was also tuberculous meningitis and pneumonia of the right lung.

6. Comby: Tuberculosis of both lungs; fetid gas and pus in the left pleura. The pericardium was adherent to both lungs; the mediastinum was displaced to the left, and the left lung collapsed.

7. Comby: Two litres of pus in the left pleura. The left lung was collapsed and adherent to the pericardium. It contained cheesy nodules. The pleura was not thickened.

8. Comby: The left pleural cavity contained about six litres of pus. The diaphragm was depressed and the mediastinum was displaced to the right. The surface of the pleura was covered with a false membrane. The left lung was solidified and adherent to the pericardium. The membrane covering it was perforated in two places. The right lung was tuberculous. The pericardium was not adherent.

9. Chvostek: The left thoracic cavity was filled with lymph; the left lung was compressed and displaced upward; there were recent pericardial adhesions; the pleura was ruptured in the fifth interspace at the site of the tumor.

10. Chvostek: The left clavicle was dislocated; several ribs were denuded and eroded, and the intercostal muscles were altered. The pleura was thickened and perforated at the site of the tumor; the pericardium was adherent to the tumor, and the lung compressed and solid.

11. Toft: A thick pseudomembrane enclosed the empyema, through which a perforation led to a subcutaneous abscess. The heart was attached to the chest wall. There was obliterative pericarditis and chronic peritonitis.

12. Toft: The left pleural cavity contained pus and air. A fistula communicated with the subcutaneous tumor. The heart was normal. Pus was present in the right pleural cavity.

13. Traube: There was massive purulent pleural and pericardial effusion. At the point of pulsation the pleura was destroyed. The pericardium was thickened; the lung compressed, and the upper lobe was atelectatic. The heart was displaced to the right.

14. Lorenzetti: The lung was adherent to the thoracic wall at several points. There was recent purulent pericarditis.

15. Dillingham: The left pleura contained some large blood clots whose source was not found; it was lined with pyogenic membrane. There was an adherent pericardium.

16. Broadbent: Obliterative pericarditis. The pericardium was adherent to the central tendon of the diaphragm and to the chest wall.

17. Pel: The heart was displaced slightly to the right. The pericardium was thickened and adherent. There were two encapsulated empyemas, one at the left border of the heart.

18. Cammareri: The parietal pleura was thickened; there was erosion of the ribs in several places; the lung was separated from the cavity by a false membrane; the left side of the mediastinum was thickened; and the left part of the thorax was larger than the right.

19. Light: There was left empyema; the left lung was collapsed; there was acute pleurisy of the right side and acute peritonitis. The heart was in its normal position.

20. Light: There was left empyema; extrapleural abscess communicating with the empyema by a fistula; the left pleura was thickened and adherent to the pericardium; the left lung was collapsed; the heart was twisted, and the pericardium contained eight ounces of clear fluid.

21. Fuchs: There was pyopneumothorax on the left side; the left lung was collapsed and partly adherent to the diaphragm; the heart and aorta were displaced to the right, and a subphrenic abscess communicated with the pleural cavity.

The most notable facts are: that the pericardium was involved in 8 cases, the left lung collapsed in 11 cases, the ribs were eroded in 3 cases, and the pleura perforated in 6 cases.

It is somewhat difficult to classify the cases into those in which pulsation is more or less diffuse without distinct evidence of tumor formation, and those in which tumors actually occur. In many cases the pulsating area is localized, although there may be no local bulging, and sometimes not sufficient distinction has been made between this form and circumscribed pulsation in a projection. As nearly as I have been able to determine there are 50 cases in which definite tumors have been recorded. Of these, 41 cases had a single tumor, 6 cases had 2 tumors, and 3 cases (Henry, Chvostek, and Toft) 3 tumors. Of these cases 37 were apparently empyemas of necessity, although some of them may have been encapsulated pleural abscesses; 11 were abscesses in some part of the thorax, either encapsulated empyemas or pleurisies, mediastinal abscesses, or extrapleural or periosteal abscesses, and 2 (Cruveilhier and Kuhlman) seem to have been cases of serous effusion with distinct local bulging or pointing. Altogether the locality of 62 tumors has been more or less definitely mentioned. Of these, 3 were situated on the right side and 58 on the left side. The 4 tumors situated on the right side were distributed as follows: in the second interspace at right border of sternum (Heyfelder); from second to fifth ribs, right border of sternum (Reyher); seventh interspace, right

border of sternum (Wilks). Of those on the left side, 2 were not localized very accurately; were on the anterior aspect of the chest; in the axillary area, and 10 posteriorly. Of the 42 in the anterior aspect, one (Cruveilhier) had a conoid tumor presenting in front of the sternum; one (Vidal) a mediastinal abscess that had perforated the lower portion of the sternum just to the left; 2 (McCosh, Martin) below the left clavicle; 4 (Plagge, Muller, Light, Wilson) were rather extensive tumors of the left side of the chest, usually discolored and reducible; 19 occupied the various interspaces from the second to the eighth, often more than one, just to the left of the sternum. In one case (Toft) 3 tumors were found at different levels in this situation; 14 were found in the precordial region; 10 tumors in the posterior portion of the chest, of which 4 were below the angle of the scapula, and 4 between the crest of the ilium and the lower border of the ribs just to the left of the spinal column; 1 was in the tenth interspace to the left of the spinal column, and 1 was not distinctly located.

It appears from this analysis that the commonest situation is beneath the costal cartilages on either side of the sternum, 22 tumors having occurred in this situation. Fourteen tumors were in the precordial region; 4 beneath the angle of the scapula on the left side, and 4 wholly below the ribs in the left lumbar region. The other tumors were somewhat irregularly distributed, probably as a result of purely local conditions. The 2 tumors that occurred in association with serous effusion had unusual situations in front of the sternum and in the left hypochondrium.

Of the cases without tumor formation, 2 occurred on the right side (Keppler, Borgiotti). In Keppler's case there were 2 encapsulated pleural effusions which gave rise to diffuse pulsation of the lateral and anterior aspects of the chest. After these were evacuated the pulsation ceased in spite of the accumulation of pus later. In Borgiotti's case there was pyopneumothorax on the right side, and the whole of the right side of the chest was involved in the pulsation. Diffuse expansile pulsation was noted in 5 cases of empyema (Stokes, Béclère, Toft, Dillingham, and Rummel), and in 3 cases of pyopneumothorax (Féréol, Wilson, and Sallés). In 2 cases (Roux and Salles) the pulsation is said to have been diffuse, but its extent is not given. In 4 cases (Flint, Bimmerman, Pitorelli, and Proust) it is not distinctly localized. The pulsation is localized as follows: in the axillary region, 6 cases; in the posterior inferior aspect of the chest, 4 cases; in the anterior region either near the sternum, in the subclavicular, or in the mammary region, 6 cases. In the case of McPhedran pulsation was seen in the axilla if the patient lay upon her back, and in the back if she lay on the right side.

In 3 cases of serous pleurisy more or less localized pulsation was seen as follows: from the sternum to the left of the axillary line, and from the clavicle to the fourth rib (Osler); in the lower

aspect of the left chest (Bailey) and in the left hypochondrium back of the false ribs (Lepine). The limited diffuse pulsation is seen in a much larger proportion of the cases in the axillary and lower posterior regions than is the circumscribed tumor.

Two of the cases (Martinez and Sailer) were hæmothorax. In the case of McPhedran the fluid on the first aspiration was bloody, but subsequently became clear. In the case of Dillingham there was apparently distinct empyema, but at the autopsy large blood clots were found in the pleural cavity. In the case of Innocenti and Marsili blood was also found in the pleural cavity upon aspiration. This patient had tuberculosis.

Martinez's patient was a man, aged twenty-one years, who had cough, pain in the left chest, and gradual progressive weakness. There was diffuse pulsation of the left side of the thorax, involving the epigastrium, more pronounced in the lower than in the upper portion, and a localized pulsation in the second, third, and fourth interspaces between the sternum and the left nipple line. There were all the usual signs of fluid in the left pleura, the heart was dislocated to the right, and its pulsations could be seen and felt in the second, third, and fourth interspaces between the right border of the sternum and the right axillary line. The spleen was low and quite palpable. An operation was performed, and 1500 c.c. of a serosanguinolent fluid was obtained. The heart returned to the left side, the pulsation ceased, and the patient appeared to have recovered.

Two months later he returned with the same symptoms; in a short time carcinoma of the lymph glands developed, and he died. The left thorax was 3½ cm. larger than the right.

The second case I observed at the Philadelphia Hospital. G. B., a West Indian negro, aged thirty years, and a laborer by occupation, was admitted, October 14, 1902. His family history was negative or unknown. He had rheumatism ten years ago; had indulged in alcohol moderately, and in tobacco to excess. For the past year he had suffered from dyspnœa on exertion, palpitation, and, for a time, cough. Three weeks before admission the cough had ceased, but he had suffered from intermittent sharp pain in or around the region of the heart. This became so severe that he was obliged to give up work, and finally entered the hospital. On the day of admission there was a loud systolic murmur heard over the heart, the whole chest, and transmitted loudly into the neck. There was a friction sound synchronous with the heart in the second interspace, just to the right of the sternum; the respiratory murmur over both lungs was normal. The following day the percussion note over the left thorax was found to be absolutely flat. Tactile fremitus and vocal resonance were absent; the breath sounds could not be heard. Over the whole of the left chest a very loud rasping systolic murmur was audible. There was distinct pulsation of the

whole of the left side. On the following day (the 16th) I dictated the following notes:

The patient is slender and muscular; the skeleton is normal; the mucous membranes are pale. The pupils are normal and react to light; there is systolic expansile pulsation in the neck and in the suprasternal notch. There is heaving impulse over the upper portion of the left thorax, extending as far as the posterior axillary line. The maximum impulse is in the fifth interspace in the nipple line. There is distinct impulse in the sixth interspace one inch outside the nipple line. Pulsation can be seen and felt as far as the tenth interspace in the posterior axillary line, and is distinctly expansile in time. There is pulsation of the upper portion of the abdomen synchronous with the heart, and a vigorous downward pulsation in the left hypochondrium. There is systolic impulse in the neck visible in the suprasternal notch. Over the apex there is a faint systolic thrill and a diastolic shock. In the second interspace to the right of the sternum there is a faint systolic thrill and a diastolic shock. In the second interspace to the left there is a powerful heaving systolic impulse, a strong diastolic shock, and an almost imperceptible thrill. Toward the axilla the thrill becomes fainter, and the systolic impulse is very powerful. In the third and fourth interspaces the systolic and especially the diastolic impulses are strong and the thrill is very faint. The systolic impulse can be felt as far as the costal border, and merges into the powerful hypochondrial pulsation. There is no pulsation at the umbilicus. There is slight pulsation in the right hypochondrium from the median to the nipple line. The radial pulses are equal, small, and rhythmical. The liver dulness commences at the seventh rib and moves with the respiration. There is some dulness on the right side as far as the left border of the sternum. From the clavicle to the border of the ribs there is absolute flatness of the left side anteriorly. The whole left side of the chest is tender, especially in the neighborhood of the fourth and fifth ribs from the nipple to the axillary line. On the right side tactile fremitus is diminished, vocal resonance is lost, respirations are vesicular, expiration is faint. On the left side the breath sounds are entirely absent. Over both lungs anteriorly as well as posteriorly there is a harsh systolic murmur not accompanied by sounds, which is loudest over the left lung posteriorly, and faintest over the right lung posteriorly near the apex. In the sixth interspace the first sound is loud, the second is loud and booming, and there is a faint systolic murmur. From time to time a distinct splashing sound is also heard. In the fifth interspace the first sound is less distinct, there is a long, harsh, systolic murmur, and a moderately accentuated second sound. In the fourth interspace the first sound is fainter, the murmur is harsher, and the second sound more accentuated. In the third interspace the murmur is still harsher, the second sound somewhat fainter, and distinctly

reduplicated. At the pulmonic cartilage a loud, harsh murmur almost drowns the other sounds. The second sound is distinctly reduplicated. On the right side of the sternum the systolic murmur is fainter, and the sounds are almost inaudible. The murmur becomes harsher toward the fifth interspace to the right. On the left side of the sternum the murmur is harsher above, but at the fifth interspace it is faint, and two loud sounds are heard. In the epigastrium a faint first and an accentuated second sound are heard. In the carotids there is a loud, harsh, systolic murmur. In the femoral arteries there are no notes, and only a faint systolic murmur is developed on pressure. *When the patient lies upon the right side the position of the right border of dulness is not changed.* The respirations are labored; expansion on the left side is diminished. The superficial lymph glands are not enlarged. The temperature is normal, and has been so since admission. The respirations vary between 20 and 30, the pulse averages 104. The urine shows traces of albumin, the specific gravity is 1010; there are no casts. The blood pressure with Oliver's tonometer is 130.

On October 17th, with the assistance of the resident physician, Dr. Holmes, I made an exploratory puncture and withdrew pure blood. Aspiration was therefore not performed. The condition of the patient now remained practically unchanged. He was evidently suffering; there was distinct expansile pulsation over the whole left thorax easily elicited by placing one hand in front and the other in the back. The pulsation in the left hypochondrium was about as forceful as the day before.

The diagnosis appeared somewhat obscure. The sudden development of the hæmothorax made a rupture of an aneurysm most likely, and this diagnosis was strengthened by the physical signs, especially the loud murmur heard all over the chest. It seemed difficult, however, to explain why there had been no displacement of the heart to the right. An *x*-ray picture was taken by Dr. G. E. Pfahler, which confirmed the physical diagnosis in so far as it showed dense blackness of the whole of the left side of the thorax, and no dislocation of the heart to the right. The patient died rather suddenly on the morning of October 18th, and at 2 P.M. of the same day Dr. Ellis performed the autopsy. The notes are as follows:

Autopsy. The body of a well-developed male negro. The external examination shows bulging of the left side of the chest that extends from the clavicle to a point about 2 cm. below the nipple, and from the left border of the sternum to the anterior axillary line. In the centre this area is raised approximately 2 cm. higher than the corresponding point on the opposite side. Reflexion of the superficial tissues shows that it is due to a prominence of the ribs and dilatation of the intercostal spaces. On the right side the diaphragm is at the lower border of the fifth rib; on the left it is convex downward, the lower portion reaching the lower border of the

rib. There are old firm adhesions between the omentum, spleen, and diaphragm, and between the spleen and left lobe of the liver. The right pleural cavity is normal. The left contains about three litres of blood, about two-thirds of which is clotted, the clots being perfectly free in the cavity. Extending toward the left from a point corresponding to the left midclavicular line there is a fairly formed band of adhesions, 8 cm. long, between the pleura, covering the second and third ribs, and what is apparently a dilated portion of the aorta. The left lung is compressed backward and to the right; it is about the size of a fist, and entirely atelectatic. The long axis of the heart is more transverse than normal. The heart extends about 5 cm. to the left and 5 cm. to the right of the median line. The pericardium is almost universally adherent by fibrinous attachments which can be broken. Aside from a slight thickening of the mitral and tricuspid leaflets, the interior of the heart is normal. Three cm. from the aortic valves there is an opening 6 cm. in length in the posterior superior portion of the aorta which communicates with a sac which extends upward and to the left. The sac projects a distance of 12 cm. from the aorta; the transverse diameter is about 12 cm. At a distance of about 5 cm. from the aorta there is an irregular slit-like opening 1 cm. in length, and there is also a second opening 3 cm. from this ½ cm. in length. The interior of the sac contains several large areas of adherent laminated blood clots; the aorta contains a few atheromatous patches just below the valves. The organs of the abdomen show nothing of interest. The pathological diagnosis is ruptured aneurysm of the ascending and transverse portions of the arch of the aorta, atheroma of the aorta, atelectasis of the left lung, and left hæmothorax.

The actual mechanism by which these diffuse localized pulsations of the thoracic wall are produced has been the subject of some dispute. Unquestionably a number of factors are active, and confusion is due rather to the fact that stress has been laid upon different ones by different investigators than that there is much actual difference of opinion. The source of the pulsation must be the heart or the great vessels. The majority of writers consider the heart the source. The pulsation must be transmitted through the pericardium, the pleura, possibly through the lung, and through the fluid or air, or both, in the pleural cavity to the point at which it is manifested. For practical purposes the thorax may be considered to be a box closed at the sides and above by a bony framework which is somewhat more yielding on either side of the sternum and on either side of the spinal column near its lower border. Below it is closed by a muscular membrane which is always in a state of tension as a result of the elasticity of the lung. This box is divided by a vertical partition composed of two layers of the parietal pleura on the right and left sides, and between them the heart in its pericardial sac, the great vessels arising from its base, the trachea, the

œsophagus, the nerves, minor bloodvessels, and glands of the mediastinal space. Under ordinary conditions the pulsations of the heart, with the exception of the apex, are entirely absorbed by the lungs, always in a state of negative pressure. It has been shown (Regnard) that with each pulsation of the heart the lungs contract slightly. If one lung is replaced by fluid under ordinary conditions pulsation will not be transmitted to the wall of the chest, because the pulsation of the heart is absorbed by the remaining lung. In the 3 cases in which I introduced a hollow needle communicating with a manometer, no cardiac pulsation could be observed; the respiratory movement, however, was in both cases considerable. In these cases there was sufficient positive pressure during inspiration to maintain the level of the fluid in a glass tube at the height of the shoulder, and during expiration it rose somewhat higher. In another case that I had examined carefully for palpable or visible pulsation, the moment the trocar was introduced the fluid spurted out with considerable force, indicating a high degree of positive pressure. I, therefore, doubt whether pulsation occurs in all cases of pleural effusion. Comby, who was the first to consider the question in a scientific manner, laid great stress upon the collapse of the lung. He believed that if the lung on the left side still contained air it was impossible for pulsation to be transmitted. In the cases that he analyzed his contention appeared to be supported, there being always actual evidence or reason to believe that the lung was completely collapsed. This, of course, is the usual condition in chronic empyema.

The theories which have been suggested may be classified as follows:

1. It is due chiefly to the violent action of the heart, the impulse being transmitted through the fluid exactly as the wave of fluctuation is transmitted through the fluid in ascites. This theory is held by MacDonnell, Fraentzel, and Wintrich. Le Roy and Aran, two of the earlier observers, seem to regard it as the most likely explanation, although their statements are not very clear. Traube supposes that in addition there must be a pericardial exudate. Keppler, Fuchs, Auerbach, Light, Bouveret, Innocenti and Marsili, and Henry consider violent action of the heart as an essential cause, but not the only one.

2. Those theories which depend upon the assumption of the existence of adhesions so limiting the fluid or bringing it into closer contact with the heart that the pulsations of the latter are more readily imparted to it. Keppler, for example, believes that the exudate must be in part encapsulated, then compressed by the thoracic wall, and brought into intimate association with the vigorously pulsating heart. Gueneau de Mussy and Broadbent lay especial stress upon pericardial adhesions. That these are sufficiently common in cases of pulsating pleural effusion, a considera-

tion of the autopsy records will demonstrate; but they do not appear to be invariably present, and therefore cannot, as Comby remarks, be the sole cause.

3. Several authors have discussed the possibility of a peculiar quality in the liquid. Comby, Toft, and others have supposed that only in cases of empyema did the pulsation exist. The preponderance of such cases lends considerable color to this view, but if the reports of serous and hemorrhagic effusion were not sufficient to disprove it, the ingenious experiment of McCosh, who filled the sac of an empyema with normal sterile salt solution after washing out the pus, and obtained a reproduction of the pulsation, would be sufficient to show that it had no basis in fact. Comby admits in his last publication that the character of the fluid is not of importance. Féréol's belief that there must be an accumulation of air under pressure has very little evidence to support it. In many cases a pneumothorax was not present. In others it certainly occurred after the puncture.

4. The observation that the withdrawal of a part of the fluid usually abolished the pulsation, and at the same time reduced the tension, led to the supposition that it was the intrathoracic tension, or, rather, the positive pressure in the liquid, that caused the pulsation.

This view has been particularly supported by Osler. It is also considered as one of the elements of explanation by Béclère and Bouveret, and meets with the approval of Toft, Henry, Lépine, Auerbach, Light, and, indeed, nearly all clinicians who have observed cases. Undoubtedly there must be a certain degree of pressure, otherwise the pulsation would not exist; but Lépine has observed that the pulsation may become more violent after the withdrawal of a portion of the fluid, or may even appear for the first time in a reaccumulation after one or more evacuations. In Toulmin's case the withdrawal of part of the liquid did not cause the pulsation to disappear, and he was led to doubt the importance of tension. Cases have also been observed in which more than one tumor was present, the pulsation occurring only in that which was most dependent, so that the mere degree of intrathoracic tension could not alone affect it. Walshe, who was one of the earliest to speculate upon this subject, believed that the tension had little to do with it, and that the pulsation was merely a manifestation of ability to transmit shocks normally found in all liquids.

5. A fifth group of explanations insist chiefly upon the fixation of the walls of the space that contains the pleural exudate. This, of course, comprises the diaphragm, mediastinum, and ribs. Destole believes that there must be immobilization of the diaphragm, partly as a result of the pressure of the pleural fluid which in time equalizes its contractile force and compresses it downward until it becomes comparable to an inert elastic membrane projecting into

the abdomen, partly by the formation of a tense false membrane upon the parietal layer of the pleura.

6. Akin to this, but expressed in a somewhat different manner, is the theory that the pulsation is manifested when the tension of the mediastinum and diaphragm becomes greater than that of the chest wall. Light gives the following explanation: the resistance of the diaphragm, mediastinum, and lung must be augmented until it becomes greater than that of the intercostal spaces. This may be produced either if the effusion is very great, or if there is a thick membrane lining the pleura. Bouveret regards the increase in the resistance of the diaphragm and mediastinum as essential to the occurrence of pulsation. Béclère believes that he has proven by experiments upon the cadaver by means of the Roentgen rays, and by means of observations upon a patient with a funnel-shaped chest, that unless the resistance of a fibrinous mediastinitis is greater than that of the intercostal spaces, pulsation is not manifest. Auerbach agrees with him, and suggests that the fact that pulsation of the heart is more vigorous on the left than on the right side explains why pulsation is more common in cases of left-sided pleurisies. In all of Toft's cases fixation of the mediastinum was favored by obstruction to the dislocation of the heart. Essentially the same idea is expressed by those who believe that the weakening of the resistance of the wall of the thorax is the most important factor. Strongly in favor of this view is, of course, the fact that pulsation anteriorly is so common beneath the weak cartilaginous portion of the ribs, and posteriorly in the neighborhood of the floating ribs. Comby mentioned the dilatation of the intercostal spaces and the paralysis of the intercostal muscles as a contributing but not an essential cause. Rummo, however, considers it of considerable importance. Light urges the importance of lessened resistance in determining the position of the pulsation, and Innocenti and Marsili regard the weakening of the chest walls as essential, and McCosh agrees with them, stating that necrosis of the ribs very commonly occurs.

7. The explanation of Wilson differs essentially from that of other investigators. He believes that "there may be (*a*) strands of atelectatic lung tissue reaching from pleural and pericardial adhesions at one extremity, by way of pleural adhesions at the other, to the surface of the chest, and thus acting as conductors of the cardiac impulse; and (*b*) the elasticity of that part of the wall of the thoracic cavity on the left side formed by the diaphragm in its relation to the fundus of the stomach is increased. The latter conditions, together with the convexity of the left wall of the heart in systolic tension, and the almost synchronous diastolic tension of the aorta of the left side of the chest, serve to explain the greater frequency of pulsation in left-sided effusion." It is conceivable that the systolic retraction might be produced by the adhesion of a sclerotic lung both to the chest wall and to the pericardium, but the results

of autopsies (the only case in favor of Wilson's theory is that of Lorenzutti) and the fact that in the great majority of cases the lung is not found adherent at the point of greatest pulsation, serve to indicate the incorrectness of this view.

The views of those who have studied the subject most carefully regarding the combination of causative factors may be briefly expressed as follows:

Toft: (1) A completely filled pleural sac; (2) dislocation of the heart; (3) involvement of the left side. Pulsation in part may be transmitted by the ascending aorta.

Traube: (1) Pulsation of the left heart; (2) weakening of the thoracic walls; (3) pericardial exudate.

Light: (1) Pressure of the empyema upon the heart; (2) vigorous heart action; (3) a certain degree of tension of the liquid; (4) an area of lessened resistance or increased tension of the mediastinum and diaphragm. Total atelectasis of the lung is not necessary.

Lépine: (1) Compressed lung; (2) diaphragm depressed and tense, but not ad maximum; (3) displacement of the heart to the right; (4) rigidity of the mediastinum.

Innocenti and Marsili: (1) Diminished resistance of the thoracic wall; (2) dislocation and violently acting heart; (3) a thickened pleura.

Béclère: (1) Left-sided effusion; (2) thickening and greater resistance of the mediastinum; (3) lessened resistance of the chest wall.

Comby: Excludes (1) alteration of the heart and bloodvessels; (2) pericarditis; (3) any peculiar character of the liquid. The chief cause is a collapsed lung. Dilatation of the intercostal spaces and muscles favors pulsation.

Fuchs: (1) Energetic heart action; (2) diminished resistance of the wall.

Auerbach: (1) The tension of the mediastinum must be greater than that of the chest wall; (2) the position of the heart toward the left favors pulsation of the left side.

Henry: (1) Left-sided large effusion; (2) relaxation of the thoracic wall from paresis of the intercostal muscles; (3) forcible heart beat.

In the case of pulsating hæmothorax that I report the obliterative pericarditis favored the increased tension of the mediastinum. The large portion of the chest wall with which the fluid was in contact served to increase the amplitude of the pulsation. With each systole of the heart it is evident that a certain amount of fluid was pumped into the chest, increasing also the amplitude of the pulsation, and that at each diastole of the heart the tension in the pleural cavity was sufficient to return a portion to the aneurysmal sac.

Pulsation appears therefore to have been due partly to the fact

that the mediastinal tension was as great as that of the thoracic wall, partly to the simple pumping of fluid into the pleural cavity. Of course, the latter factor could only occur in case of ruptured aneurysm causing a hæmothorax; that in some respects would be considered a false aneurysmal sac. With the majority of those who have studied this subject, I believe that several factors are involved, but also that some of these factors are of more importance than others. The character of the fluid being of no significance, the cause must be sought in the containing walls. If there was no resistance to the continued increase in the quantity of fluid it would soon occupy the entire thoracic cavity. This resistance is found in the mediastinal tissues, which can be stretched only to a limited extent, and this stretching may be further diminished by thickening of the pleura and by pericardial and extrapericardial adhesions. The side of the mediastinum farthest away from the collection of fluid will, as a result of its greater convexity, be tensest, and, therefore, will resist the pulsation of the heart in that direction. Either as a result of depression until it becomes convex downward, when muscular contraction would tend to keep it rigid, or as a result of adhesions in the lower portion of the pleural cavity, the diaphragm also ceases to yield, and the quantity of fluid tends to remain constant. At this stage the resistance of the mediastinum, the diaphragm, and the thoracic walls must, of course, be equal, according to the physical laws of fluid under pressure in confined spaces. If then, pulsation is communicated to this fluid at any one point it will be manifested probably most distinctly at the point diametrically opposite in the containing wall. This pulsation, however, may be modified in a variety of ways. Thus, if the wall at this point is rigid and in some adjacent place is relaxed and weakened, it will be most pronounced in the relaxed portion, and it may occur that, as a result of the local yielding at this point, it will be cumulative. As long as a partly inflated lung is found in the pleural cavity, whose surface is not rendered rigid by thickened pleuræ, it will form a point of lessened resistance and absorb part or all of the pulsation. Therefore, the conditions necessary for the production of the pulsating pleurisy are: first, an accumulation of fluid under such a degree of positive pressure that the pressure upon the wall of the thorax, the mediastinum, and the diaphragm is equalized. Second, the lung must be solid or surrounded by a dense fibrous capsule, or walled off partly by the thickened pleura, partly by adhesions to the chest. Third, the existence of some local point of weakened resistance such as is produced by the empyema necessitatis, or of such a degree of elasticity of the entire thoracic wall that it pulsates as a whole. It is obvious that a thickened parietal pleura which would serve to enhance the other factors might so diminish this that pulsation would not occur.

Two other forms of pulsation occurring in the thoracic walls

are of historical interest. In 1837 Stokes[1] reported a case of pulmonary carcinoma in a man, aged forty-five years, in which there was diastolic double pulsation in the upper sternal and subclavicular regions, accompanied by a bellows murmur. At the autopsy an encephaloid carcinoma of the left upper lobe was found. Graves,[2] in a case of croupous pneumonia of the right side, observed pulsation of the whole of the anterior wall of the thorax quite as vigorous as in the neighborhood of the heart. In this case, also, a bellows murmur was heard over the heart. As far as I have been able to ascertain no cases of either condition have ever been reported subsequently. Both Comby and West speak of them as practically unknown in France and England at the present time. The ability of Stokes and Graves is too great for us to question their powers of observation or diagnosis; but there can be no doubt that such cases are so excessively rare that they need hardly be considered.

The subject may be summarized as follows: Pulsation of the wall of the thorax may be due to disease of the heart or bloodvessels; may be idiopathic, that is, not the result of any definite cause; may be due to pleural or pericardial adhesions; to accumulation of fluid in the pleural cavity, or to abscess of the wall of the thorax. When the pulsation occurs as a result of accumulation of fluid in the pleura the left side is affected in the majority of cases. The patients are usually males and less than forty years of age. The mechanism depends in all probability upon the existence of a positive pressure in the pleural cavity with tension of the mediastinum.

PYOPERICARDIUM AND COMMENCING INTERSTITIAL PNEUMONIA COMPLICATING ILEOCOLITIS IN AN INFANT AGED FOUR AND A HALF MONTHS.

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AND

J. C. Gittings, M.D.,

of Philadelphia.

Purulent pericarditis is always a secondary affection in infancy and early childhood, and is prevalent in inverse proportion to the age of the patient. Thus of 66 cases of pericarditis seen by Baginsky under fourteen years of age, 20 were purulent, and of these 11 were in the first year of life, the oldest being seven years. Monti saw, among 35 pericarditides in children, 5 in sucklings, all of which

[1] A Treatise on the Diagnosis and Treatment of the Diseases of the Chest, London, 1882, Part I., p. 391.

[2] Ibid., p. 292.

were suppurative. Batten observed 6 purulent cases under three years, 1 of which was four, 1 ten, and 1 eighteen months old; and Still, in 67 pericarditides of non-rheumatic origin, discovered 17 in which the fluid was slightly turbid, with a few flakes of lymph, and 11 in which pus was actually present. Of the first group, 12 occurred within the first three years, while all of the 11 pus cases were under three years; so that 23 of the 28 cases were within the third year of life.

It would appear, therefore, that effusion into the pericardium is almost always purulent in infancy and early childhood, and in the newborn is invariably so, being usually the result of infection through the navel, although there may be other ports of entry.

After the first month suppurative pericarditis is less frequently encountered, but from the middle of the first year it is again met with, decreasing in frequency up to the fifth or sixth year, when the influence of rheumatism comes into play; the pericarditis of which, being, as a rule, serous, does not concern us at this time. When we inquire into the frequency with which purulent effusion into the pericardium occurs in early life we must conclude that it is probably more prevalent than is generally supposed. Because of the great difficulty in recognizing the condition, the diagnosis, in infants, at least, is usually, as in our case, first made at the autopsy-table (Coutts, Batten, Baginsky). Batten, for instance, found it present in 3 per cent. of the autopsies in the Great Ormond Street Hospital for Children; and Still, in about the same proportion, viz., 28 cases in 769 autopsies upon children (3.6 per cent.). In 364 autopsies at the Children's Hospital, Philadelphia, the percentage of cases in which actual pus was present in the pericardium was 1.1 per cent., and of cases in which the fluid was slightly turbid, with flakes of lymph, 1.1 per cent., a combined percentage of 2.2 per cent. of cases which may justly be regarded as purulent.

In the first month suppurative pericarditis occurs as part of the septic processes, so common in the newborn; later in infancy and in early childhood it may owe its origin to a variety of affections. Thus pleurisy and empyema, pneumonia, tuberculosis (usually of adjacent organs), the acute infectious diseases, follicular angina, otitis and mastoid disease, gastroenteritis, osteomyelitis and bone caries, chronic nephritis, gastric ulcer, affections of the mediastinum, peritonitis, meningitis, abscesses of the skin, and other pyogenic processes have all been found associated with purulent pericarditis. Its connection with enteritis, without an intervening pneumonia, mentioned by C. Gerhardt and Baginsky, are the only instances we are aware of, except our own case, in which the primary affection was in the intestinal canal. According to Still, the most common cause is pneumonia, especially pleurisy and empyema complicating pneumonia. This occurred in 22 of his 23 cases of purulent pericarditis under three years; of the whole 28 pyopericardii observed by

this writer, 24 were associated with empyema. In the Children's Hospital the proportion is much lower, only 50 per cent. of the cases being associated with pneumonia or pleurisy.

As to the bacteria met with in suppurative pericarditis, the pneumococcus appears to be the most frequent; indeed, Still and Coutts, from a study of their cases, conclude that it is almost invariably the offending micro-organism. The species of bacteria present in a given case is usually that of the primary affection: in the septic forms the streptococcus or staphylococcus; in tubercular pericarditis the tubercle bacillus; in cases following pneumonia the pneumococcus; occasionally the Friedländer bacillus has been found; one of Baginsky's cases was due to the pyocyaneus, and another to the colon bacillus. The pericardium may be infected at a very early stage of the primary disease, or at a later period, or as a terminal event, as was probably the case in our patient.

Owing to the insidious onset, indefinite symptoms and the paucity and uncertain nature of the physical signs, the disease is generally unrecognized during life. The patient may present the appearance of a grave malady; there may be cachexia, restlessness, feeble pulse, and fluctuating temperature. But in the very young all these symptoms may be absent; especially may the patient be quite fever free, or have a subnormal temperature, while all indications of cardiac disease may be missing, and the most certain, in fact, the only positive means for recognizing pericardial effusions, viz., the physical signs, are, according to the testimony of experienced clinicians, notorious for their rarity and indefiniteness. The heart sounds may be dull, and the apex beat weak or absent (signs difficult to appreciate in infants); but friction rubs are seldom if ever heard, and, except in large effusions, the most reliable sign, increase in the cardiac dulness, cannot be demonstrated. This is due to the small amount of pus generally present; to the limiting by adhesions of small collections of pus to the base of the heart; to the frequent presence of left-sided empyema or consolidation; but, above all, to the absence or slight degree of dilatation of the heart, a feature so constantly present in the pericarditides of older children and adults. For these reasons the diagnosis is very apt, as in our case, to come first as a surprise at the autopsy table (Baginsky), and no discredit attaches to the failure to recognize the affection during life.

As the issue is almost invariably fatal in the suppurative pericarditis of infancy, and as in timely drainage lies the only hope of saving life, we should make, in all affections of the young in which pericarditis is likely to supervene, careful daily examinations of the cardiac area. Especially should free drainage be established as early as possible in all cases where turbid serum or lymph are present in the pleural sac, because such presence, as long as it remains, exposes the patient to the risk of pericardial inflammation (Still). The same may be said of pyogenic processes and collections

of pus wherever situated. With these preliminary remarks, we present the history of the patient whose case is the subject of this paper:

Eddie A., a foundling, aged four and a half months, was admitted to the Children's Hospital October 16, 1903. He had been fed entirely upon condensed milk since birth and had gained very slightly in weight. Otherwise the patient had been in fairly good health, with little indigestion or diarrhœa. Five days before admission he "caught cold"—*i. e.*, had fever, coryza, cough, etc. Simultaneously there was a profuse, greenish diarrhœa, with much mucus and blood and some tenesmus. When first seen the patient was having from six to ten stools daily of greenish, bloody mucus; there was great prostration, a temperature ranging but little above normal (99° to 100° F.), a pulse of 140, and a respiration rate of from 32 to 40. The head was retracted and the neck muscles somewhat rigid. A slight internal strabismus of the right eye appeared to be present, and the conjunctival reflex was readily elicited. The knee-jerks were exaggerated, but there was no ankle clonus, nor could Kernig's sign or the Babinski reflex be demonstrated. The infant was rickety and undersized. Subcrepitant rales could be heard at the bases of both lungs, but the percussion note was clear, and there were no signs of pneumonia. During the patient's short life in the hospital the temperature fluctuated widely, with a daily maximum of between 100° to 101° F., falling to normal just before death. The stools were numerous, largely composed of mucus, the blood disappearing as the case progressed. The slight meningeal symptoms above noted, with the exception of the strabismus, persisted; but were attributed rather to toxæmia than to meningitis. Two lumbar punctures were made, but no fluid was obtained. The urine was voided freely and was negative. At no time was there any indication of cardiac implication; the heart sound, it is true, became quite feeble before death, a symptom readily explained by the marked asthenia. The cardiac area, however, was not percussed. During the two weeks the patient was in the hospital there had been a loss of weight of eighteen ounces. Death was due to asthenia.

From the Pathological Laboratory of the Children's Hospital.
Dr. J. C. Gittings.

The following is a brief résumé of the notes taken at the autopsy of Eddie A., performed twenty-two hours after death:

Body of a moderately emaciated white boy. The abdominal organs are normally situated. The intestines are distended with gas. On section the mucosa of the large bowel is thickened, covered with tenacious mucus, moderately congested, and shows numerous enlarged and prominent follicles. There is no ulceration. The liver is fatty. The gall-bladder is distended with dark-brown, highly

viscid bile, which can be forced through the common duct with difficulty. The spleen and kidneys are moderately congested. Both ureters are dilated (5 mm. in diameter), but no obstruction can be found. In other respects the abdominal organs and structures appear normal.

The pericardium is slightly distended. It contains about 15 c.c. of cloudy serofibrinous exudate. Both layers of the pericardium are covered with a rough, "plush-like" layer of fibrin. This is especially marked over the base, at the point of origin of the great vessels. The process is recent, and the heart muscle presents no change. The endocardium is normal.

The right lung weighs 36 grams. The pleural surfaces are normal in appearance. Throughout the middle and lower lobes there is moderate congestion, with here and there small areas of

Chronic interstitial pneumonia: *l*, lung tissue; *c*, broad bands of connective tissue.

consolidation. Sections exude a slight amount of blood-tinged, foamy serum. The bronchial glands are slightly enlarged and deeply congested.

The left lung weighs 29 grams, and shows the same changes, to a less extent. Sections hardened in Müller formol, mounted in paraffin, and stained with hæmatoxylin and eosin show the following:

Liver. Marked congestion, with cloudy swelling of the hepatic cells and areas of fatty degeneration. There is no increase in the connective tissue; the bile ducts appear normal.

Spleen. Moderate congestion; the Malpighian bodies are enlarged and prominent.

Colon. Moderate increase of intertubular tissue, with round-celled infiltration into the submucous tissues. The lymph follicles are large and project into the lumen of the bowel.

Kidney. Granulation of the cells of the convoluted tubules, with exudation into the lumen. The glomeruli are moderately congested. The tubules in the medullary area are filled with granular detritus.

Lungs. Sections from both upper lobes show normal tissue. Sections from the right lower lobe show the following interesting changes: The pleura is greatly thickened and running in from it are numerous broad bands of connective tissue which divide it up into lobules. In some areas the bronchioles are very large and seem to be increased in number. (This is in part explained by the fact that the lung tissue is shrunken and the bronchioles are, therefore, relatively prominent.) The connective tissue around many of the bronchioles is infiltrated with polymorphonuclear cells. Many of the air cells are greatly dilated and distended with a few desquamated lining cells and numerous polymorphonuclear leukocytes. The alveolar walls in many places are thickened. In other areas the air cells are filled with polymorphonuclear cells and a few red blood cells. The bronchial lymph glands are congested.

Heart. The pericardium shows on its visceral surface an exudate consisting chiefly of fibrin enclosing polymorphonuclear leukocytes, endothelial cells, and bacteria. Below this fibrinous exudate the loose subendothelial tissue contains numerous congested capillaries, and marked round-celled infiltration. This infiltration extends down between some of the superficial muscle bundles. The muscle fibres show no marked change.

Bacteriology. In sections of the spleen and lung stained with Loeffler's alkaline methylene blue, cocci and diplococci can be seen. These do not stain by Gram's method. They probably represent post-mortem infection. In the heart muscle and the pericardial exudate, cocci, diplococci, and short bacilli are seen. Unfortunately, nothing could be determined from the cultures taken from the pericardial fluid and spleen at autopsy. The original cultures would not grow on reinoculation. They consisted of a mixed growth containing cocci, diplococci, and a short bacillus.

The records of the Children's Hospital contain notes on 364 autopsies performed since September, 1891. Among these cases there was disease of the pericardial sac in 16 (4.39 per cent.). In 4 cases the exudate was described as purulent or fibrinopurulent, in 4 as serofibrinous, and in 2 as fibrinous. Six of the cases showed chronic adhesions without recent exudate. Besides these, there were 19 instances of clear serous exudate in excess of the normal amount (30 c.c. being considered as the normal maximum).

As a "serofibrinous" exudate represents often but an earlier stage of the inflammation, and as the description "cloudy serum containing flakes of lymph" may be interpreted as belonging either to the serofibrinous or purulent classifications, it would seem more rational to consider all exudates as purulent in which the serum was other than clear. From this point of view, 8 of the cases may justly be

regarded as purulent. Confirmatory proof should be furnished by the bacteriological findings, which, we regret, are not available in our own series. As an evidence of the difficulty referred to above, of demonstrating *in vivo* purulent collections in the pericardial sac in infancy and early childhood, we have noted the clinical diagnosis in these cases. In only 2 of them, it will be seen, was the condition recognized during life—*i. e.*, 75 per cent. were not diagnosed.

CASE I.—F. S., aged seven years. Clinical diagnosis: Pleurisy with effusion; purulent pericarditis. Pathological diagnosis: Purulent pericarditis; left serofibrinous pleurisy; calcified miliary tubercles in the lungs; purulent arthritis of the knee. Note: The pericardium contained 900 c.c. of fluid. Both the pleurisy and pericarditis were secondary to the infection of the knee.

CASE II.—D. S., aged four years. Clinical diagnosis: Lobar pneumonia and pleurisy (double); pericardial effusion. Pathological diagnosis: Purulent pericarditis; double lobar pneumonia and pleurisy (with effusion). Note: The pericardium was "greatly distended."

CASE III.—K. D., aged fourteen months. Clinical diagnosis: Pneumonia. Pathological diagnosis: Fibrinopurulent pericarditis; right-sided bronchopneumonia and fibrinopurulent pleurisy. Note: "Large amount" of pericardial fluid.

CASE IV.—F. S., aged five years. Clinical diagnosis: Pneumonia. Pathological diagnosis: Fibrinopurulent pericarditis; lobar pneumonia (double); fibrinous pleurisy (left). Note: Amount of pericardial fluid not mentioned.

Cases II., III., and IV. were instances of pericarditis complicating pneumonia.

CASE V.—J. B., aged eighteen months. Clinical diagnosis: Bronchopneumonia. Pathological diagnosis: Serofibrinous pericarditis and pleurisy (double). Note: 100 c.c. of pericardial fluid; lungs compressed and almost airless. The pericarditis was secondary to the pleurisy.

CASE VI.—B. S., aged three years. Clinical diagnosis: Endocarditis. Pathological diagnosis: Serofibrinous pericarditis; double pleural effusion; hypertrophy and dilatation of the heart; chronic myocarditis. Note: Pericardium distended, displacing the lung. In this case there was a history of a scarlatinal rash five weeks before admission. In other respects the history was indefinite, and it is impossible to decide what was the sequence of events.

CASE VII.—A. V., aged eight months. Clinical diagnosis: Organic heart disease. Pathological diagnosis: Serofibrinous pericarditis; chronic mitral and aortic valvulitis; hypertrophy and dilatation of the heart; double pleural effusion; passive congestion of the abdominal organs; infarcts in the lung. Note: "Much" fluid in the pericardial sac. Pericardium presented "bread-and-butter" appearance.

CASE VIII.—Aged four and a half months, reported in this paper.

Fifty per cent. of the cases were secondary to pneumonia or pleurisy, which adds further evidence of the importance of these diseases in the etiology of purulent pericarditis. Four of the children were under eighteen months and 6 under four years, thus bearing out the universal testimony that the pericarditis of early life is usually purulent.

Of particular interest was the condition in the lower lobe of the right lung. Jacobi has called attention to the comparative frequency of a pure, proliferative, interstitial, chronic inflammation of the lung. This condition has been included by most authors under the general term fibroid phthisis, or has been considered a distinct sequel to the other inflammatory lung diseases, particularly bronchopneumonia. Jacobi recognizes it as a distinct clinicopathological entity—a primary lung affection—and considers that "it is particularly in infancy and childhood that this class of hypertrophy of the connective tissue, terminating in shrinking, is most frequently, almost exclusively, observed."

In our own case there was no evidence of syphilis; there was no history of pneumonia; alcohol and lead could not have been operative in its causation, and the case, therefore, seems to belong to the class of primary pleurogenic interstitial pneumonias, the etiology of which remains to be determined.

References.

A. Baginsky. Berlin klin. Wochenschrift, November 28, 1898, p. 1053.
A. Monti. Kinderheilkunde in Einzeldarstellungen, Berlin u. Wien, 1903, p. 407.
E. Weill. Traité des maladies de l'enfance, Paris, 1897. tome iii. p. 631.
F. E. Batten. British Medical Journal, 1901, vol. ii. p. 605.
G. F. Still. Ibid., p. 606.
C. Gerhardt. Handbuch der Kinderkrankheiten, Bd. iv. p. 159 et seq.
J. A. Coutts. Edinburgh Medical Journal, 1902, vol. liv., n. s., xii., p. 273.
J. A. Coutts. British Medical Journal, January 2, 1904.
A. Jacobi. Archives of Pediatrics, 1903, vol. xx. p. 1.

THE TREATMENT OF CHRONIC INTERNAL HYDROCEPHALUS BY AUTODRAINAGE.

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Internal hydrocephalus was recognized by the ancients, and the hopeless progress of the disease, in spite of medical care, led Hippocrates to tap the distended ventricles.

[1] Read before the Surgical Section of the New York Academy of Medicine, February 5, 1904.

Since his time there have been many and varied attempts to relieve or cure the condition.

Congenital hydrocephalus is usually rapidly fatal after birth, and therefore will not be considered surgically. Acquired hydrocephalus appears several months after birth and progresses rapidly or slowly, steadily or intermittently, or may, in a small number of cases, come to a permanent standstill. There is no spontaneous retrogression.

In the cases examined post-mortem there have been found, almost constantly, inflammatory changes in the choroid plexuses of the ventricles and in the ependyma covering the optic thalami, creating obstruction to the outflow of blood through the venæ Galeni and therefore favoring an abnormal amount of secretion into the ventricles. There is also a more or less extensive general ependymitis, which retards absorption and favors increased secretion into the ventricles.

Another constant and very important lesion is the occlusion of the natural outlet for the ventricular fluid. In very rare cases one or other foramen of Munro may be occluded, causing unilateral hydrocephalus. More commonly either the aqueduct of Sylvius or the foramen of Majendie is closed. Only very rarely is the central canal of the cord involved. These various lesions often result from the extension of a basilar meningitis secondary to traumatism, or tubercular, gastrointestinal, nasal, or other infection.

There is present then a condition due to increased secretion and diminished absorption or escape of the ventricular fluid. The greater the pressure of fluid, the greater the interference with absorption, since the brain is distended, compressed, and its circulation materially retarded. This vicious circle is established early in the disease.

The surgical aim is largely a mechanical one, to allow the escape of the retained fluid so as to save the brain from pressure damage and to favor its return toward normal condition.

The early attempts at surgical relief consisted in simple puncture, with evacuation of more or less of the ventricular contents. This operation was repeated as often as the distention reappeared, while the child lived. A very few cases of improvement or cure have been recorded after this treatment, but by far the greater number have been unfavorably influenced. Repeated punctures, even where infection is not introduced, cause an inflammatory reaction, with the presence of albumin in the ventricular fluid, and an exacerbation of symptoms. A modification of this method consisted in injecting iodine or other cauterizing solution just after tapping the ventricle (as in hydrocele), with the hope of diminishing the ventricular secretion. Patients showed an undue tendency to die after this injection, and the method was discarded.

For a time attention was turned to puncture of the lumbar cord,

with evacuation of spinal fluid, in the hope of diminishing the cerebral distention, as being a procedure attended with less danger. Quincke worked on a number of cases in this manner, but with unsatisfactory results. The same dangers attend repeated punctures of the cord as were noted in case of the brain. A very few cases of improvement have been recorded. As there is no communication between the retained ventricular fluid and the spinal canal or central canal of the cord, little can be hoped for from this method.

The rapid return of cerebral distention after the simple tapping naturally led up to the idea of establishing continuous drainage, and this was done by passing a drain into the ventricle and leading the other end into a mass of sterile dressings on the outside of the head. It is practically impossible to keep these cases from being infected, and they die from this cause, if death from the too rapid emptying of the ventricle does not forestall the entrance of germs.

In one of Keen's cases a most instructive thing occurred. A small rubber tube was inserted into each lateral ventricle, and after the fluid had escaped rather too freely the patient developed a temperature and convulsions. The ventricles were then distended with warm boric acid solution, and the symptoms disappeared almost immediately. This series of events was repeated once or twice.

From the methods outlined up to this point nothing is to be hoped for, since the constant secretion of ventricular fluid requires permanent drainage, and external drainage cannot be continued indefinitely.

In 1896 Dr. Leonard Hill published a series of observations on the *Physiology and Pathology of the Cerebral Circulation.* He demonstrated that the tension of the cerebrospinal fluid and of the blood in the cerebral veins was normally the same, and that any increased intracranial pressure drove the cerebrospinal fluid into the veins and out of the skull.

Also he noted that fluid thrown into the subdural and subarachnoid spaces was rapidly absorbed.

These observations soon suggested the idea of subdural drainage and in 1898 Sutherland and Cheyne operated on two cases. The incision was made in the left inferior angle of the anterior fontanelle, the dura was opened, and one end of a strand of catgut was passed between brain and dura and the other end was carried into the ventricle by means of a thumb forceps. One case died of bronchopneumonia at the end of three months, and the other was still living at the time of the report (six months). No improvement, mental or physical, was noted in either case.

Mikulicz passed a gold tube into the right ventricle, leaving its outer end in the subcutaneous tissues about 5 cm. from the middle line and vertically above the ear. After three weeks the tube

ceased to drain and was then inserted into the opposite ventricle. The child died in six weeks unbenefited.

In a second case he used a glass-wool drain in the same situation, but made it subdural rather than subcutaneous. In this case the disease appeared to be arrested.

Brewer's operation consists in making an osteoplastic occipital flap, a flap in the dura, elevating the posterior lobe of the cerebrum, and with curved dressing forceps pushing a rubber-tissue drain up into the lateral ventricle of one side. The brain is dropped back and the wounds in the dura and overlying parts are rapidly closed. Of the three cases only one lived six weeks, during which time there was a decrease of three inches in the head's circumference.

Senn published a case in 1903 in which he made a large pocket in the subcutaneous tissues of the temporal region for good lymph drainage, inserted one end of a fenestrated rubber tube into the pocket, and then carried the other into the ventricle, between the temporal and frontal bones. The head diminished considerably in size, but the child died in two weeks.

The very great majority of the cases operated upon have died within a short time of operation.

In the literature it is notable that the cases which drained rapidly were most prone to die, and observers have repeatedly mentioned that rapid emptying of the ventricle is apt to be followed by a high rise of temperature and convulsions. (See Keen's case, previously mentioned.) It has been suggested also that the cerebrospinal fluid is poisonous, and therefore, in internal drainage, should not be poured into the general circulation too rapidly.

A method of drainage, then, to be successful, must be internal, must be slow, and must be prolonged or permanent. It would seem as if a small permanent fistula between the ventricles and the subdural space would most closely resemble normal conditions, and in the hope of attaining that end six cases were operated upon as follows, under general anæsthesia:

An osteoplastic flap about two inches in diameter is turned down, with its hinge over the base of the mastoid and just above the level of the horizontal lateral sinus.

In the lower part of the dura mater thus exposed, a semicircular flap, base downward and about one inch in diameter, is made. Frequently there are one or two distended veins beneath this dural flap, and they should not be damaged, for their walls are so friable that neither clamp nor ligature is of much use, and the bleeding is annoying.

The brain immediately protrudes through this dural window. A slender aspirating needle is passed through the second temporosphenoidal convolution (which is the one protruding), inward and slightly upward until it enters the ventricle, when the clear fluid

spurts out and is collected in a sterile tube for bacteriological examination. Only a very small amount should be allowed to escape in this way.

The thickness of the brain tissue is measured by observing the length of needle inserted when the fluid begins to escape.

The drain is now made of No. 2, forty-day chromic catgut. Three loops (six strands), about an inch and three-quarters longer than the thickness of the brain, are bound together by a loose spiral of catgut, starting at one end and stopping so as to leave an inch and a quarter of the loops free. In other words, the drain consists of a shaft of six strands of catgut a half-inch longer than the brain thickness and, spreading from its base, three free loops of gut an inch and a quarter long. Around the shaft of the drain, but not covering its tip, are rolled three layers of cargile membrane. With a long, narrow-bladed thumb forceps the tip of the drain is seized and carried into the ventricle along the tract made by the aspirating needle. The tip projects about one-half inch into the ventricle. The free loops of gut are slipped under the dura between it and the brain surface, in different directions, but chiefly downward toward the great lymph spaces at the base of the brain. A sheet of cargile membrane is slipped between the dura and the catgut loops to prevent adhesions. Usually by this time sufficient ventricular fluid has escaped, so that the brain no longer protrudes through the dural window.

The dura is sutured with catgut, the bone-flap is held in place by three or four chromic catgut sutures, the deeper soft tissues by catgut, and finally the skin with silk. A good-sized sterile dressing is applied with some pressure.

The site just above and behind the ear, with the puncture through the second temporosphenoidal convolution, was chosen because the *body* of the lateral ventricle is drained. Where anomalies of the ventricles exist they most frequently involve one or other of the horns. Afterward, moreover, the escaping fluid leaves the brain in close proximity to the great lymph spaces and venous sinuses at its base—a fact which favors its rapid absorption. The right side of the brain is chosen because, if any irritation of the motor areas occurs, the left side of the body is involved, and more particularly Broca's speech centre is not disturbed, as it lies in the left hemisphere.

The approach to the brain is easy; the brain need not be handled, and is but slightly injured in the insertion of the drain.

Drains passed through the dome of the brain, which is always very thin (as in Mikulicz and Sutherland's cases), would be more liable to displacement or to interference with function, because it is here that the brain undergoes most change in contour as the ventricular contents escape. Again, the drainage is farther away from the great channels of exit.

Drainage through the under surface of the occipital lobe is open to objection because it involves handling of the brain itself, which is thin, soft, and friable.

The forty-day chromic catgut was used as a drain with the hope that before it was dissolved a chronic fistulous communication would have formed between the ventricle and subdural space.

The cargile membrane was wrapped about the shaft of the drain to prevent the soft brain tissue from being crowded in between the strands of the drain and so preventing the escape of the ventricular contents. It was also hoped that it would form a facing to the punctured tract and so facilitate the formation of a chronic fistula.

The free loops of catgut coming from the shaft of the drain were pushed between the dura and brain to lead the escaping fluid beyond the area where adhesions would be apt to form between the brain surface and dural flap.

During the closure of the wound the ventricular fluid escapes rather freely. The first dressing is applied firmly with adhesive plaster to limit the external drainage, but, in spite of this, the dressing is well moistened during the first twenty-four hours. After that there is no further external escape of ventricular fluid.

By this method, with slight modifications in the various cases, the following six patients were operated upon during the last two years, at Randall's Island Hospital:

CASE I.—David S., aged five and one-half years, had been an inmate of the idiot ward at Randall's Island for several years. No record was made of his history.

The house staff said his head was increasing slowly in size, but no record of measurements had been kept.

Physical Examination. The trunk and extremities were small and poorly nourished. Motion, both active and passive, was free in all the joints (no contractures or ankyloses). Voluntary motion of the extremities was accompanied by muscular tremor and marked ataxia. The condition of the reflexes was not recorded.

The heart, lungs (except for a few rales over each base), the digestive and urinary apparatus were in good order. The head was enormous, with large frontal, parietal, and occipital bosses. The skull was completely ossified.

The head was so heavy that he could neither sit nor stand, nor even roll the head over when lying down.

The eyes protruded forward and downward, showing the sclera between the upper lid and iris. Marked nystagmus was present.

Mental Condition. He recognized his spoken name with an imbecile smile, and when asked what his name was, could speak it. He knew only the simplest monosyllables. He would shake hands with anyone who approached and spoke his name.

The head measurements were: circumference, 62.5 cm.; bis-auricular (meatus to meatus over vertex), 43 cm.; nasion to inion,

41 cm. Temperature ranged between 99° and 100° F.; pulse ranged between 96 and 108; respiration ranged between 20 and 24.

July 10, 1902. Operation done under chloroform anæsthesia. In this case a trephine one and one-half inches in diameter was used, and the button of bone was discarded. When the dura was opened the brain protruded a full half-inch beyond it and did not pulsate (evidences of marked tension). With an aspirating needle enough ventricular fluid was evacuated to bring the brain to the dural level (two and one-half ounces), when the drain was inserted and the wound closed. Time of operation, thirty-five minutes. The wound healed by primary union.

Following operation the temperature rose steadily till at the end of sixty hours it reached 106° F. (pulse, 152; respiration, 38). For the next two days it ranged from 103° to 105° F. From this time the temperature ran an irregular course, with a general tendency toward normal, which it reached at the end of the tenth week after operation. During this time there were sibilant and sonorous rales over both lungs, chiefly at the bases.

For the first six weeks the child was in a condition closely resembling the typhoid state, but after that there was slow, steady, general improvement. A week after operation it was first noticed that all the joints of the left upper and lower extremities were continually held in the flexed position. Daily massage and passive motion corrected this difficulty, so that the extremities were freely moved both actively and passively by the end of the third month.

On the fifteenth day after operation there was so much return of intracerebral pressure as to cause a considerable protrusion of cranial contents at the site of operation. With aseptic precautions one and one-quarter ounces of fluid were removed from the ventricle with a fine aspirating needle. On the thirty-fifth day one and one-half ounces were again removed for the same reason. The fluid was clear and proved to be sterile. After each tapping the volume and strength of the pulse improved, but otherwise there was no noticeable effect. Although a certain degree of protrusion persisted, it was never again tense enough to indicate further tapping. After the third month the protrusion grew distinctly softer and smaller, the eyes receded into their cavities, and the nystagmus disappeared. The drainage was now apparently working efficiently.

There has been no physical improvement worth noticing, although it is now twenty months since operation.

The mental improvement is the feature of interest in this case. With recovery from the three months' illness following the operation he began to recognize the doctors, nurses, and the other patients by name, to tell which way they had gone from the room, to call the children to their meals, to quarrel verbally, and to fight with his hands if the other children came sufficiently close, and to sing simple

songs. He is still unable to sit or stand, or move his head while lying down.

Since the skull was completely ossified, no diminution in its size could be expected.

CASE II.—Daniel Z., aged thirteen months. Admitted to hospital February 2, 1903.

Family History. Negative.

The mother's first child was born dead after a difficult labor. The next two children are alive and well.

Personal History. Daniel was the fourth child, was a breech case, was delivered by a midwife, and suffered a broken leg in the process. He was otherwise normal at birth. He never had convulsions or any serious illness. When he was five months old his parents noticed that his head began to grow rapidly, and this abnormal growth has continued.

Physical Examination. The trunk and extremities are of good size, well nourished, and are perfectly normal. The reflexes are normal. The viscera give no evidence of disease. He cannot sit or stand, because of the unwieldy head. He can roll his head about while lying down. The head is large; the anterior fontanelle is large, bulging, and the brain beneath it very tense and not pulsating. The eyes protrude and show the sclera all around the iris. Moderate nystagmus is present. He has four incisor teeth, two in each jaw. He recognizes his mother, apparently.

January 9, 1903. Head measurements: circumference, 49 cm.; bisauricular, 35.75 cm.; nasion to inion, 32.45 cm.

26th. Circumference, 50 cm.; bisauricular, 36.20 cm.; nasion to inion, 34.65 cm.

March 12th. Circumference, 59 cm.; bisauricular, 43 cm.; nasion to inion, 40 cm., which means an increase per week: circumference, 1 cm. +; bisauricular, 1 cm. —; nasion to inion, 1 cm. —.

13th. The operation was done under chloroform anæsthesia. Everything went smoothly, and the operation was finished in thirty minutes. In this case only a small quantity of fluid (half an ounce) was allowed to escape through the aspirating needle.

The maximum temperature in this case after operation was 103° F. on the second day. It fell rapidly to normal and stayed there. The child was at no time really sick. It took milk with appetite after twelve hours. Recovery was uneventful. The wound united by primary union.

The measurements at various dates were as follows:

March 29, 1903 (sixteenth day). Circumference, 59 cm.; bisauricular, 43 cm.; nasion to inion, 40 cm.; oblique diameter of anterior fontanelle, 9.3 cm. each.

April 9th (twenty-seventh day). Circumference, 59 cm.; bisauricular, 43 cm.; nasion to inion, 40 cm.; oblique diameter of anterior fontanelle, 9.3 each.

26*th* (forty-fourth day). Circumference, 59 cm.; bisauricular, 42 cm.; nasion to inion, 41 cm.; oblique diameter of anterior fontanelle, 9.3 each.

May 10*th* (fifty-eighth day). Ecchymosis appeared in the scalp above and in front of the operative area.

17*th* (sixty-fifth day. The head appeared asymmetrical (smaller on the right side). Unfortunately measurements taken were not transferred to the record book and were lost. Nystagmus no longer present.

27*th* (seventy-fifth day). A subperiosteal hæmatoma three inches in diameter appeared just above the operative field. No cause was known for its appearance, and it disappeared spontaneously but slowly.

June 3*d* (eighty-second day). Circumference, 55.6 cm.; bisauricular, 40.6 cm.; nasion to inion, 37 cm.

26*th* (one hundred and fifth day). Circumference, 57 cm.; bisauricular, 41.5 cm.; nasion to inion, 38 cm.

Bony union had not occurred in the osteoplastic flap. The head was noticeably smaller and flattened on the right side (side of operation), and permission to operate on the left side was asked, but the parents refused and took the child home.

On November 22, 1903 (two hundred and fifty-fourth day—eight and one-third months), he was seen at his home. His general condition was good: the eyes were not protruding and looked natural and intelligent. No nystagmus. The anterior fontanelle was slightly retracted and normally pulsating. He was playing in his crib, recognized the other members of the family, could say "Mamma," and took an interest in his surroundings.

The measurements of the head were as follows: circumference, 61 cm.; bisauricular, 44.5 cm.; nasion to inion, 41.5 cm.; oblique diameters of the anterior fontanelle, 8 cm. each.

Bony union had occurred between the skull and osteoplastic flap.

On February 2, 1904 (three hundred and twenty-sixth day—eleventh month), there was still further general improvement. He could almost support the head in the erect position, but made no effort to stand. He was begining to talk. The measurements were: circumference, 61.5 cm.; bisauricular, 44 cm.; nasion to inion, 41 cm.; oblique diameters of anterior fontanelle, 7 x 7 cm.

CASE III.—Bella H., aged six and one-half years.

Family History. Negative.

Personal History. Had convulsions when a baby and soon afterward the head began to grow to abnormal size.

Physical Examination. The trunk and extremities were fairly well developed. The reflexes were much exaggerated, especially on the right side.

The head was very large, 61 cm. in circumference, and completely ossified.

The eyes were divergent and protruding.

The child was imbecile.

July 16, 1903. The operation was done under chloroform anæsthesia, and lasted forty minutes. One ounce of ventricular fluid was removed. During the first seven days the temperature ran between 101° and 104° F.; pulse, 118 to 136; respiration, 24 to 28; then gradually fell to normal on the sixteenth day.

The wound healed by primary union.

There was no change for better or worse, mental or physical, in this case. As the head was completely ossified no change in size was to be expected.

On September 10, 1903 (fifty-sixth day), she died of an attack of gastroenteritis.

CASE IV. Annie E., aged five and one-half years.

Family History. Negative.

Personal History. The child was perfectly well and strong until four years of age, when the parents noticed she could not walk so well as usual. Soon afterward they noticed the head was growing more rapidly than before.

At the time of operation, one and one-half years from the onset, both lower extremities were paralyzed, the mental power was feeble, and the head measured 57 cm. in circumference. It was completely ossified.

July 17, 1903. The operation was done under chloroform anæsthesia. In raising the dural flap from the brain, to which it was slightly adherent, a distended vein was divided. Its walls were so friable that there was annoying delay in stopping the hemorrhage.

The aspirating needle passed through 2 cm. of brain tissue to reach the ventricle. An ounce and a half of the fluid was collected for bacteriological examination. (The fluid was sterile.)

The drain (eight strands of No. 2 gut, *i. e.*, a little larger than usual) was inserted, and the operation completed as before. The patient was returned to bed in good condition. The operation lasted one hour. The intracranial tension was considerable, and drainage was free during the closure of the wound, and for twenty-four hours the dressings were well saturated. Before operation the temperature was 99° F.; pulse, 120; respiration, 22. The morning after operation, temperature, 103.8° F.; pulse, 138; respiration, 30. The evening of the second day the temperature had reached 106.2° F.; pulse, 168; respiration, 38; so it was deemed wise to open the wound. There were no signs of infection. Cultures were taken from the wound area, but proved sterile. The brain was under great tension, and nothing was escaping along the drain; so the needle was passed into the ventricle and two ounces of fluid withdrawn. There was temporary improvement in the general condition, but the patient died a few hours later.

The pathologist reported the fluid of this second tap sterile.

It is to be noted that this operation took much longer, the drain was larger, and the escape of fluid at and immediately after the operation, more free than usual.

CASE V.—Benjamin H., aged four years.

Family History. Negative.

Personal History. Was well till six months old, when he had severe convulsions, followed by pneumonia. After this the head grew noticeably, and the child was less bright.

Physical Examination. The trunk and limbs were fairly well developed. The head was large in proportion to the body and completely ossified.

The child is imbecile.

The measurements in this case were lost.

July 31, 1903. The operation was done under chloroform anæsthesia in forty minutes, and went off smoothly. A half-ounce of the ventricular fluid was withdrawn and sent to the pathologist, who reported it sterile.

The day after operation the temperature reached 102.8° F.; pulse, 154; respiration, 30. On the fourth day the temperature was 99.4; pulse, 144; respiration, 30. The patient looked well and took nourishment with relish.

On the sixth day (temperature, 101.6° F.; pulse, 158; respiration, 28) he became restless and irritable, and late in the day there appeared a thick, purulent discharge from the right auditory canal.

On the eighth day anuria developed, and he passed into coma and died, in spite of efforts to stimulate action of the kidneys.

CASE VI.—Frank R., aged ten months.

Family History. Mother's first child died in twelve weeks. Second and third born dead at seven months. Fourth, fifth, and sixth children are all healthy. The patient is the seventh child.

Personal History. Breast fed. Perfectly well until three months old, when he had an attack of fever, convulsions, vomiting, and diarrhœa. The acute attack lasted one week, but convalescence was very slow. Two months after this acute attack the parents noticed his head was growing rapidly.

For some weeks it was noticed that in the late afternoon he was restless, and not infrequently would become rigid for a few minutes.

He entered the hospital November 6, 1903. On November 15th he developed a severe attack of colitis which lasted several weeks. His convalescence was slow.

Physical Examination. The trunk and extremities were unusually large and well nourished, and could be freely moved, actively and passively. The viscera showed no signs of disease. The reflexes were normal.

The head was very large and tense, especially the anterior half. The anterior fontanelle was wide open, protruding, and was con-

tinuous with the posterior one by a space 2 cm. wide between the parietal bones. He could not hold the head erect, but could roll it from side to side while lying down. The eyes were protruded forward and downward and showed sclera between the upper lid and iris. There was slight nystagmus. Two upper incisors were present.

November 11*th*. Head measurements: circumference, 54.5 cm.; bisauricular, 38.6 cm.; nasion to inion, 38.5 cm.

15*th*. Colitis.

19*th*. Circumference, 54.5 cm.; bisauricular, 38.9 cm.; nasion to inion, 38 cm.

December 5*th*. Digestion again good.

24*th*. Circumference, 55 cm.; bisauricular, 39.5 cm.; nasion to inion, 39 cm.

January 16, 1904. Circumference, 56 cm.; bisauricular, 40.5 cm.; nasion to inion, 39.5 cm.

The operation was done under chloroform anæsthesia. The skull and overlying parts were very thin. In this case, again, one of the veins beneath the dura was damaged and caused annoying bleeding and delay. The brain was under great tension, and was very thin, the needle passing in only 1 cm. when the ventricle was reached. One and one-half ounces of fluid were allowed to escape before the brain receded to the level of the dural opening. In closing the wound after inserting the drain, the dura was sutured, the bone-flap was simply laid back in place without sutures, and the soft parts closed over it.

The whole operation went slowly and very unsatisfactorily. It lasted fifty-five minutes.

During the closure of the wound the ventricular fluid escaped freely, so that at the end of the operation the head, which had been tense, was quite relaxed and the fontanelle depressed. This indicated too rapid escape of the fluid, so a firm dressing was applied and strapping was used to reproduce intracranial tension.

For the first twenty-four hours there was a rather free escape of fluid into the dressings, but the patient was apparently doing well, and took nourishment with relish.

Six hours after operation the temperature reached 102° F.; pulse, 130; respiration, 30. The next morning the temperature was 99° F.; pulse, 130; respiration, 30, but in the evening the temperature reached 103.4° F.; pulse, 130; respiration, 34.

On the second day, temperature, 105.4° F.; pulse, 150; respiration, 46. In the night of the second day there appeared spasmodic twitching of the left upper extremity and face. Third day the twitching was more marked and the temperature reached 106° F.; pulse, 160; respiration, 58.

The dressings were changed, and a few drops of pus exuded from beneath the skin-flap. The wound was opened. The pus seemed

to have come entirely from the superficial tissues, as the dura and brain did not appear to be involved. The wound was cleaned, a 1:10,000 bichloride drain placed under the flap, a wet dressing over the wound, and a light-pressure bandage applied. An ice-cap was applied to the head.

The kidneys were not secreting very actively, so a rectal saline irrigation (temperature, 100° F.) was ordered every six hours. After the first irrigation the urine came freely. The twitchings ceased within an hour; the patient became quiet and took nourishment more readily.

During the following two days the temperature descended to 103° F., there were only occasional twitchings, and there seemed to be slight general improvement. The dressings showed no more pus.

In the early morning hours of January 22d (six days after operation) he was left in apparently good condition by the nurse going off duty. A short time afterward the relieving nurse went to look at him and found him dead.

From the time of operation the exophthalmos and the nystagmus disappeared.

RESULTS: *Mortality:* Cases I. and II. are still living, twenty and eleven months, respectively.

Case III. lived two months and died of acute gastrointestinal disturbance.

Case IV. died about sixty hours after operation, and unquestionably as the result of it.

Case V. had apparently reacted from the operation by the fourth day, then developed otitis media, which drained satisfactorily; then, finally, anuria and death on the eighth day. Death probably would not have occurred at that time had no operation been performed.

Case VI. died suddenly on the sixth day, when he had apparently been slowly recovering from the sharp reaction of the first three days. The wound was infected, but apparently not in the deeper tissues.

The mortality of the operation in these six cases, then, was 50 per cent.

	Age.	Fluid evacuated.	Time of operation.		
Case I	5½ yrs.	2½ oz.	35 min.	Marked reaction.	Recovery.
" II.	13 mos.	⅛ "	30 "	Slight "	"
" III.	6½ yrs.	1 "	40 "	" "	Operative recovery; died in 2 mos. from intercurrent disease.
" IV.	5½ yrs.	1½ oz.	50 min. (vein wounded).	Marked reaction.	Death in 2 days.
" V.	4 yrs.	½ oz.	40 min.	Mild reaction.	Died 8 days; anuria.
" VI.	10 mos.	1½ "	55 " (vein wounded).	Marked reaction. Infection.	Died in 6 days.

It is a fact worthy of notice that in all the cases where the ventricular fluid was evacuated freely at the time of operation, or during the

first twenty-four hours, there was a sharp reaction, shown by the temperature, pulse, and general condition of the patient. (See Cases I., IV., and VI.)

Cases II., III., and V., on the other hand, showed a comparatively mild reaction.

With all due allowances for variations of the cases in other respects, this fact would argue strongly against producing any sudden change in the hydrostatic condition of the brain. The analogy with the disturbances due to sudden evacuation of old, large, pleuritic and abdominal effusions is close.

That prolonged drainage can be obtained by this method seems demonstrated by Cases I. and II.

In Case I., twenty months after operation, the signs of intracranial pressure are still absent, although the head had been slowly growing up to the time of operation (not proven by recorded figures), and at the operation the brain showed evidence of great ventricular distention.

Case II. is even more positive. For nearly ten weeks preceding operation the recorded measurements showed an average increase of 1 cm. per week in the cranial circumference.

Eleven months after operation the circumference is only $2\frac{1}{2}$ cm. greater than at the time of operation. Meantime the whole child has grown much larger. Moreover, the soft, somewhat retracted fontanelle, the absence of exophthalmos and nystagmus show that there is no undue intracranial pressure.

It is interesting to note that in both cases the drainage became most active about two and one-half to three months after operation.

Case I. is considerably improved mentally, but still remains a hopeless physical combination of a feeble body unable to support or move its enormous head. This brain had been subjected for a number of years to pressure, and this during a period normally devoted to its active development, interference with which means irreparable damage for life.

Case II. is much benefited mentally and physically. It is probable that his body and legs will eventually support his head, in which case he may become a fairly normal child. (His tenement-house surroundings are not, by any means, such as to give him the best opportunity for development.)

From what has preceded it seems fair to deduce the following fundamental principles for the operative treatment of chronic internal hydrocephalus:

1. The only feasible method is some form of internal or auto-drainage.

2. Drainage to be successful must be (*a*) permanent or at least prolonged; (*b*) slow, aiming rather to prevent further distention of the brain than to cause rapid emptying of the ventricles. Drainage

through the aqueduct of Sylvius and foramen of Majendie are naturally slow.

3. Operation must (*a*) be brief, to avoid shock in children; (*b*) involve least necessary traumatism to the brain; (*c*) involve but small escape of ventricular fluid, to avoid sudden change in the hydrostatic condition of the brain.

4. Operation, to attain its best results, must be performed early in the disease, before irreparable damage has been done to the brain structures.

Remarks from the Neurologist's Standpoint, by L. Pierce Clark, M.D.

Undoubtedly the success from operative treatment depends not a little upon the age at which operation is done. Early treatment cannot be too emphatically insisted upon. It should be undertaken as soon as the child is old enough to withstand the operation and before ossification is complete. Anything which prevents the development of the child's brain, particularly for the first three years, is attended with serious consequences. The nerve fibres of the pyramidal system perfect their sheath covering during this period. The perfection of this system goes hand in hand with the function of equilibration and co-ordination. Non-development at this period is serious enough in itself, as the child can never quite recover this handicap, even though the cause be removed; but to this non-development in internal hydrocephalus is added degenerative changes because of pressure. The latter gives rise to positive and distressing symptoms. They may be summarized as (*a*) mental weakness; (*b*) convulsions; (*c*) contractures; (*d*) loss of sight. The mental enfeeblement ranges all the way from mild grades of feeblemindedness to that of more or less complete idiocy. The latter state most frequently obtains. Convulsions occur in these cases on account of pressure, primarily, which culminates in many instances in permanent structural changes in the cerebral cortex. The attacks partake of the same general convulsive characteristics as those seen in idiopathic epilepsy, and the cell change underlying the fit in the two instances are probably identical. Epilepsy in hydrocephalus, however, is never recovered from. Convulsions which increase in frequency and have a tendency to occur in groups or series should in themselves speak for early operation.

The contractures which soon develop in these cases due to destruction in the motor tracts are usually heralded for a time, however, by gradually increasing spasticity, in the lower limbs first and finally in the arms. When this spasticity can be easily overcome by passive movement the disturbance in the motor tracts is not probably beyond that of irritation, and can be recovered from in greater part—a point of considerable value in prognosis in operative treatment.

One of the most distressing symptoms which adds to the climax of bodily helplessness in hydrocephalus is the occurrence of more or less complete blindness. This is caused by one or all three means: (*a*) pressure on the optic thalamus and optic radiation; (*b*) pressure on the optic chiasm; (*c*) traction upon the optic nerve. Inasmuch as total blindness is heralded for some time by paroxysmal temporal hemiopia, pressure on the optic chiasm is probably the main cause of blindness in most instances.

It is just possible that the *x*-ray may yet help us to measure the amount of fluid distention in the ventricles, the thickness of the cerebral cortex, and the state of cranial bones.

There can be no doubt that the success of any operative procedure must embrace (*a*) the minimum of brain manipulation; (*b*) slow and permanent drainage, which conditions, I believe, Dr. Taylor's operation has fairly met. Possibly a slight continuous compression of the head might avoid the too sudden withdrawal of the inhibitory cerebral control over the lower medullary centres, the too sudden withdrawal of which has only too often expressed itself in the past in anuria, convulsions, high temperature, vasomotor and secretory disorders of the abdominal viscera.

The after-treatment of these cases resolves itself into a problem of medicopedagogical training.

It would seem hardly necessary at the present day to speak against the establishment of a profuse diarrhœa, diuresis, or the use of large doses of mercury and iodides to aid drainage in such weakened organisms as hydrocephalic children, were such procedure not still advocated in some text-books.

I have had the opportunity of following four of Dr. Taylor's cases through the operative treatment, and I think he states the results fairly. His operation not only seems the most feasible, but is along the line destined to promise the best results in treatment of a well-nigh hopeless affection if allowed to take its natural morbid course.

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Bibliography.

Sutherland and Cheyne. Treatment of Hydrocephalus by Intracranial Drainage, British Medical Journal, October 15, 1898, p. 1155.

Leonard Hill. The Physiology and Pathology of the Cerebral Circulation, London, 1896.

W. Degré Ueber Hydroceph. Chr. dessen Entstehung, Prophylaxe und Behandlung, Wien. med. Wochenschr., 1903, p. 604.

W. W. Keen. Surgery of the Lateral Ventricles. Verhandlungen des X. Internat. Medicinischen Congresses, 1891, Band iii.

Johann v. Bókay. Ueber den Werth der systematischen Lumbalpunction bei der Behandlung des Hydrocephalus chronicus internus bei Kindern, Jahrbuch f. Kinderheilkunde, 1903, Bd. lvii. p. 229.

A. Henle. Beitrag zur Pathologie und Therapie des Hydrocephalus, Mittellungen aus den Grenzgebieten der Medizin und Chirurgie, 1895-1896, 1, S. 264.

Schultze. Krankheit. der Hirnhäute und Hydrocephalus, Spec. Pathologie und Therapie von Nothnagel, Bd. ix. th. 3.
Holt. Diseases of Infancy and Childhood.
Starr. Organic Diseases of the Nervous System.
Brewer. Text-book of Surgery, 1903.
Senn. Internal Hydrocephalus, International Clinics, 1903, 13th series, vol. i. p. 131.
Park. Medical News, New York, 1897.
Floersheim. Revue gén. de clinique et thérapeutique.
Marie. Loc. cit.
Moncorvo. Sur la pathogenie de l'hydrocéphalie congénitale, Journal de clinique et de thérapeutique infantiles, 1897, vol. v. p. 842.
Haushalter. Étude sur l'hydrocephalie, Revue de médicin, 1897, vol. xvii. p. 624.
D'Astros. Les hydrocephalies, G. Steinheil, Paris, 1898, p. 341.

A CASE OF SPLENOMEGALY WITH BLOOD CHANGES AND SYMPTOMS RESEMBLING THOSE OF BANTI'S DISEASE, APPARENTLY DUE TO MALARIA.[1]

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After Osler's[2] careful studies of conditions resembling the one about to be described, and the work of Lippy, Wentworth, and others, cited by him, an historical or pathological discussion to which no new fact could be contributed would be out of place. As the patient whose case I wish to put on record is living and apparently improving, and as the affection with which she suffers is usually chronic, there is no reason to wait for an autopsy (which we are bound to hope will long be postponed) before reporting the clinical observation. Moreover, single cases may be of importance in the final classification of a subject as yet very obscure.

As Osler has pointed out, and as we can all recall as we pass in review our personal observation, either of cases carefully studied and recorded, or of cases vaguely recalled of which no scientific record was made, the combination of enlarged spleen, enlarged liver and blood changes of an anæmic or chlorotic type, is not exceptional, while combinations of two of these three factors are not infrequent. There seems, however, to be among the motley groups in which these pathological factors are commingled in various

[1] Paper read and patient presented before the College of Physicians of Philadelphia, March 2, 1904.

[2] The American Journal of the Medical Sciences, 1900, vol. cxix.; Transactions of the Association of American Physicians, 1902, vol. xvii. pp. 428, 456.

sequence and degree one which may be separated as possessing certain additional characteristic symptoms and of which Lichty[1] in a recent literary study could find record of only 34 cases sufficiently described. To this group of cases Osler would affix and restrict the designation *anæmia splenica*, and even *anæmia splenica chronica*. Of its earliest stages little is, or from its nature is likely to be, known; of its intermediate stages much has been written; and to its late stages the name of Banti's disease has been given. If we accept Osler's definition in its entirety, the case to be reported does not fall within the group he has erected; for he insists on an unknown etiology, especially excluding malaria and syphilis. On the other hand, while there is no diminution of leukocytes, the enormous size of the spleen, the peculiar pigmentation of the skin, the pulmonary, nasal, and gastrointestinal hemorrhages, the apparently secondary character of the hepatic involvement, the diminution of erythrocytes, and the low hæmoglobin content of the blood, tally precisely with Osler's description.

The blood was carefully studied by competent observers without finding parasites until—following the administration of quinine—it was again examined by Dr. Rosenberger, who succeeded in demonstrating an organism of a type not common, at least in the United States. Several interesting diagnostic queries thus arise. In the absence of the discovery of the organism, would the case have come into Osler's group, and is it now to be excluded? Is it possible that in any large number of the recorded cases examination at an earlier stage—for our case is probably of not more than two years' duration—would have revealed malarial parasites? Is it possible that in recorded cases in which the parasite is said to have been absent, and in which no distinct history of malaria was given, administration of a sufficiently active salt of quinine would have driven parasites into the peripheral circulation, where they could have been found? I can have no definite answer to propose to these queries, and I have not studied all the recorded cases with sufficient critical minuteness to hazard a guess. I am satisfied that in very many cases, certainly in those in which Osler reports its absence, malaria was not present. But are we to be restricted entirely to an etiological diagnosis in this obscure condition, as we are properly restricting ourselves wherever possible? Are we at all sure that all the accepted cases have one and the same etiology? If a multiple etiology be permissible, why draw the line at malaria? except it be on the same principle as Dickens' barber, who remarked to a man whom he had declined to shave, that "the line 'ad to be drawn somewhere, and he drew it at coal 'eavers." In Lichty's tables the line is not drawn at the humble plasmodium or even at less respectable germs. He includes 7 cases

[1] Journal of the American Medical Association, February 20, 1904, p. 528. Eshner's case is not included in this list, and probably others might be added.

of malaria and 2 of syphilis. I quote in summary the other features of his analysis. Twenty-six cases were males, 8 females; the average age was thirty-six years. Melanoderma was present in 17 cases. Splenic enlargement was the most prominent feature in all, and anæmia the next. Hemorrhage occurred in 24. Hæmoglobin averaged 47 per cent.; the red cells, 3,293,000; white cells, 5594. Excluding 2 cases in which there was leukocytosis, the leukocytes averaged 4381. The liver was enlarged in 16 cases, small in 1. Ascites was present in 7, swelling of feet and legs in 9, glandular enlargement in 3, gastrointestinal symptoms in 8, and cardiac murmurs, generally hæmic, in 11. In only 2 cases was there albumin, a trace, while the 1 reported by Lichty had considerable at times, as well as pus and casts. Of 25 cases treated medically, only 5 recovered, 12 were improved, and 7 died, hemorrhage having been the commonest cause. Operation was performed in 8 cases, with 5 recoveries and 3 deaths.

I may also note at this point that even in Osler's own series of 18 cases, malaria had been present in 5. Osler excludes it as a factor in the splenic anæmia, however, on the ground of time. In 3 of the patients (aged forty years, fifty-six years, and thirty years) the infection was in childhood; in only 2 was it in adult life—in 1, twelve years, in the other eighteen years before the onset of the present illness. In view of the tendency of the malarial organism to lie dormant for long periods, possibly in the spleen, possibly in the bone-marrow, possibly elsewhere, in an unknown stage, and over many years—more than twenty years in 1 of my cases of chronic, recurrent malaria—can we be sure that this admitted infection was devoid of moment in the cases reported? It is true that in cases of prolonged malarial infection (and such was the fact in the instance I have referred to) paroxysms of various kinds are usually manifested with some kind of periodicity—recurring annually or semi-annually, as a rule—and that well-timed, persistent search in the peripheral blood, especially if the patient be placed under the influence of quinine, iron, or residence at an altitude, will eventually find the organism. Nevertheless, in my case of long-standing malarial infection, there were many successive months when organisms were invisible to almost daily search in the peripheral blood, and others have had similar experience. Thus the possibility of the existence of malarial infection, despite the failure of good observers to discover the organisms, must be admitted; and with this admission, until a definite etiology is established for the anæmia splenica of Osler, cases conforming clinically to the type may usefully be studied together.

Osler's definition is: "A chronic affection, probably an intoxication of unknown origin, characterized by a progressive enlargement of the spleen, which cannot be correlated with any known cause, as malaria, leukæmia, syphilis, cirrhosis of the liver, etc. (primary

splenomegaly); anæmia of a secondary or chlorotic type (leukopenia), a marked tendency to hemorrhage, particularly from the stomach, and in many cases a terminal stage with cirrhosis of the liver, jaundice, and ascites (Banti's disease)."

The case history of my patient, condensed from Dr. Slifer's ward notes, may be given briefly:

Summary. History of chills and fever in Italy two and a half years ago. Irregular fever, subsiding in hospital (acute bronchopneumonia); greatly enlarged spleen and liver; melanoderma; hæmic murmur; nasal, pulmonary, and gastrointestinal hemorrhages; marked anæmia with low hæmoglobin content; variable leukocyte count; malarial organisms found with difficulty and only after the administration of quinine.

Maria B., the patient herewith exhibited, is said to be fourteen years of age, but appears to be older. Although well developed and of Italian race, she has not yet menstruated. As she cannot speak English and an intelligent interpreter was lacking, little could be gleaned in the way of history or subjective symptoms when she was admitted to the Philadelphia General Hospital on December 12, 1903. She had at that time a slight fever, with pain in the chest and cough, accompanied with expectoration of blood-tinged mucus; and physical examination revealed signs—scattered areas of dulness, harsh breathing, subcrepitant rales, and friction sounds—that warranted a diagnosis of (influenzal?) bronchopneumonia, with concomitant pleurisy. The Widal reaction was not manifested in the blood or the diazo reaction in the urine, tubercle bacilli were absent from the sputum, which contained pneumococci, staphylococci, and streptococci. Enlargement of the spleen and enlargement of the liver were noted, as well as the presence of a faint systolic murmur at both base and apex of the heart. Malarial organisms were looked for and not found. The course toward recovery (of the acute attack) was uneventful. As cough, pain, and fever subsided, attention was given to the chronic conditions, and the outlines of spleen and liver carefully delimited by palpation and percussion. The lower border of the spleen was found to extend two inches to the right of the median line and three inches below the umbilicus. Thence the right border ran in a diagonal line toward the costal margin, which it cut one and a half inches to the right of the left mammillary line. Above the costal border percussion flatness extended to the fifth interspace in the mammillary line, to the sixth in the midaxillary line, and in the posterior axillary line to the lower border of the scapula in rest. The upper posterior corner of the splenic flatness was on the line of the upper border of the sixth dorsal vertebra, one inch to the left of the middle line of the back; thence the line extended diagonally forward to the posterior axillary line, which it cut at the margin of the ribs, there merging into the posterior border of the abdominal mass outlined by palpation.

The liver was found by percussion to reach to the eighth dorsal spine superiorly, inferiorly to the twelfth. Anteriorly the liver flatness in the mammillary line reached from the upper border of the fifth rib to a line one and a half inches below the costal margin. By palpation the liver was found to extend across the epigastrium as far as the right or anterior border of the spleen, when it apparently sank below the latter organ, which could be grasped separately. The abdomen as a whole was somewhat distended, the superficial veins well marked; there was no ascites; the conjunctivæ were slightly icteroid. The patient, as may be seen, is of dark skin, but has a deep red—not cyanotic—flush on both cheeks; the lips are of a good red color. Small pigmented areas are found over the entire body—the face, the neck, the thorax, the back, the arms, the abdomen, the legs, the soles of the feet. They vary in size from a pinhead to an irregular oval, whose long diameter may be one-half inch, and in hue from light yellow almost to black. The prevailing shade is a deep brown. On admission a history of constipation was given, but this symptom was absent while in the hospital; the bowel movements on admission being, indeed, liquid and of a light color.

January 3, 1904. The patient had a slight hemorrhage from the nose, which was followed by hæmoptysis, cough, and expectoration of blood, mostly bright red and frothy, though some clots were found. She did not complain of pain. Following the hemorrhage the pulse was rapid and rather weak and the area of splenic dulness seemed to be perhaps slightly decreased. Five days later the patient coughed up during the night about eight ounces of blood of a bright-red color, with a few small clots. In the morning epistaxis occurred, and the following night there was vomiting of about three ounces of partially clotted blood.

On January 10th the patient passed by bowel about six ounces of bloody fluid, described in the ward notes as "mostly pure blood, liquid and dark in color."

Examinations of the blood from the finger and of the urine were made from time to time, some of which may be quoted.

December 19, 1903. The urine was amber in color; acid in reaction; specific gravity 1016; sugar absent; trace of albumin present; no casts found.

January 21, 1904. The urine was reddish brown in color; acid in reaction; specific gravity 1014; sugar absent; albumen absent; no blood; no casts.

December 12, 1903. Hæmoglobin, 59 per cent.; red blood cells, 1,890,000; white blood cells, 23,450 (acute bronchopneumonia in active progress). Differential count of 200 leukocytes: small lymphocytes, 13.5 per cent.; large lymphocytes, 8.5 per cent.; polymorphonuclears, 77.5 per cent.; basophile, 0.5 per cent. An occasional megaloblast was observed; no malarial parasites demonstrable (Drs. Calhoun, J. C. Da Costa, Jr.).

January 1, 1904. Hæmoglobin 63 per cent.; red blood cells, 2,290,000; white blood cells, 14,000 (acute bronchopneumonia subsiding); no malarial parasites (Dr. J. C. Da Costa, Jr.). Widal's reaction, using dilution of 1: 40, was negative in thirty minutes (Dr. Calhoun).

Failing to find malarial organisms it was decided, nevertheless, to begin treatment with the double hydrochlorate of quinine and urea, with the hope that this might perhaps disturb existing conditions in such a way that parasites might be found peripherally in accordance with an old clinical observation that in cases of latent malaria removal to a mountainous district or the administration and withdrawal of quinine would in many cases cause the development of frank paroxysms of ague.[1] Whether for this reason or for some other, Dr. Rosenberger's observation now detected the malarial organism.

14*th*. Hæmoglobin, 34 per cent. (following hemorrhage); red blood cells, 1,280,000; white blood cells, 10,400; nucleated reds present (Dr. Calhoun). Differential count of whites: polynuclear, 90 per cent.; lymphocytes, 6.5 per cent.; hyaline, 1.5; eosinophiles, 2 per cent.; microcytes, macrocytes, poikilocytes present; also a few macroblasts, normoblasts, and phantom reds; parasites present (Dr. Rosenberger).

22*d*. Hæmoglobin, 46 per cent.; red blood cells, 2,640,000; white blood cells, 7420 (after subsidence of acute bronchopneumonia); parasites present.

26*th*. Hæmoglobin, 48 per cent.; red blood cells, 2,690,000; white blood cells, 7800; nucleated reds present; parasites present (Dr. Calhoun).

The further description of the blood will be found in Dr. Rosenberger's report herewith appended.

Quinine having been withdrawn, treatment with arsenic was begun, Fowler's solution being pushed apparently to the point of tolerance as manifested by œdema of the eyelids and face. The dose, however, at which this symptom occurred was very small, about 10 minims three times daily. The arsenic was intermitted for a week, and then resumed, when after a few days of small doses the recurrence of œdema was noticed. Arsenic was then withdrawn entirely and remembering an old observation by J. M. Da Costa on the effect of ergot in diminishing malarial spleens, this drug was given in ascending doses, beginning with ten drops of the fluid extract and reaching thirty drops three times daily. Œdema, however, continued to recur and disappear during the administration of ergot, and it was then concluded that this was a phenomenon of the case itself, having no relation to the administration of drugs.

[1] I first read of this fact in Archibald Billings' First Principles of Medicine, London, 1838, p. 218; sixth edition, 1868, p. 433.

To test the point the ergot was suspended and arsenic again given, the œdema continuing to appear and disappear during the persistent administration of arsenic and during the withdrawal of arsenic. As the hemorrhages ceased and the patient began to gain in strength an *x*-ray picture was made. The patient was not at all incommoded by the examination, and the thought was suggested of attempting to use the therapeutic influence of the rays. She was accordingly treated twice weekly by Dr. Johnson with Roentgen radiations from a low-vacuum tube at a distance of twelve inches from the spleen; the period of exposure at first being five minutes, gradually increased to ten minutes. In addition, our object being not a therapeutic study, but an attempt to help the patient if possible, treatment with quinine and urea hydrochlorate was resumed, 15 grains being given by hypodermic injection daily, with instruction to cease when symptoms of cinchonism should be manifested. These have not appeared up to date, but the injections have nevertheless been discontinued on account of the local pain caused, and the drug is given by the mouth instead. In this connection W. J. Morton's observations on the therapeutic value of "internal fluorescence" through conjoint use with Roentgenism of quinine, fluorescin, æsculin, etc., are to be remembered.

Whether from rest, from nutrition, from *x*-rays, from ergot, from arsenic, from quinine, or from all these combined, or despite them, a great improvement has taken place in the condition of the patient. She is bright and cheerful; hemorrhages have not recurred since the date last noted, and the spleen and liver have diminished in size to the extent shown by the markings herewith exhibited, by which it will be seen, to be brief, that the outer border of the spleen has receded about two inches all around from the previous abdominal markings and that the liver extends but seven-eighths of an inch below the border of the ribs instead of one and a half inch as previously. Unfortunately our therapeutic observation cannot be continued, as the Immigration Commissioners claim the girl, as a public charge, for return to Italy.

The report of the blood examinations by Dr. Rosenberger, and his comments thereon, follow:

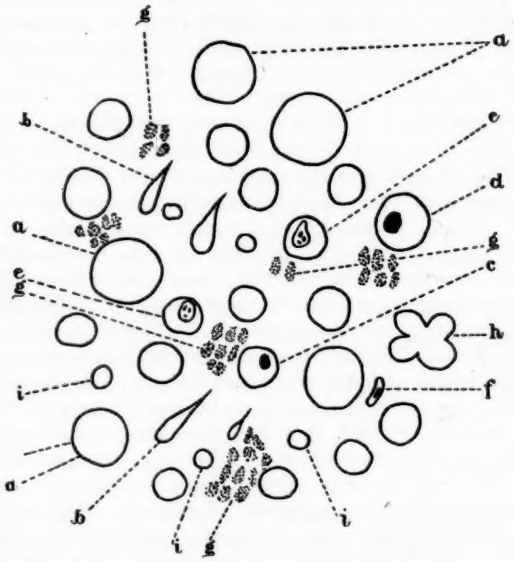
January 14th. The blood was thin, watery, pale, and of retarded coagulability. In the fresh state the erythrocytes were irregular in size and shape; microcytes, macrocytes, poikilocytes, nucleated forms (normoblasts and macroblasts) and a few pale or indistinct cells were present. There was no apparent increase of white cells, and the polymorphonuclear form was the most prominent.

In the preparation were a number of small bodies, some circular, some slightly oval. Some of these bodies were slightly granular, though most were hyaline. A few contained small fine pigment granules in an amotile state; some were intracellular, while the

greater number were extracellular. Hæmoglobin, 34 per cent. (Dare's hæmoglobinometer); erythrocytes, 1,280,000; leukocytes, 10,400 (Dr. Calhoun).

Spreads were stained with Ehrlich's triple mixture, some with Wright's, and others with Jenner's stain. A differential count of the leukocytes resulted as follows: polymorphonuclear, 90 per cent.; lymphocytes, 6.5 per cent.; hyaline cells, 1.5 per cent.; eosinophiles, 2 per cent.

In these stained preparations the bodies above referred to were plainly visible, mostly extracellular and possessing a finely granu-



a. Megalocytes. *b*. Poikilocytes. *c*. Normoblasts. *d*. Megaloblasts. *e*. Intracellular parasites. *f*. Extracellular parasite suggestively crescentic. *g*. Blood platelets. *h*. Deformed erythrocyte. *i*. Microcytes.

lar, faintly reticulated appearance. Ross' method was also used to demonstrate the parasites with success. Suggestively crescentic-shaped bodies were present.

20th. At this examination the blood presented the same interesting features.

In fresh preparations were the small hyaline bodies as noted in the first specimen, several of which were slightly motile.

There were few poikilocytes; an occasional nucleated red cell (normoblast) and a few phantom cells were still present, as well as the condition of microcytosis and macrocytosis. In spreads prepared with Wright's stain the bodies were evident; in some there was a

background or matrix staining an extremely delicate or pale blue. Hæmoglobin, 45 per cent. (Dare's hæmoglobinometer); erythrocytes, 2,640,000; leukocytes, 7420 (Dr. Calhoun). Differential count of leukocytes was: polymorphonuclear, 77.5 per cent.; lymphocytes, 14 per cent.; hyaline cells, 5.5 per cent.; eosinophiles, 2.5 per cent.; basophiles, 0.5 per cent.

In one or two hyaline cells an apparent nucleolus was situated eccentrically. Only two normoblasts were found in each of several spreads examined.

23*d*. Spreads of the blood were made at twelve o'clock (noon), 2 P.M., 4 P.M., and 6 P.M. In the fresh condition a few spherical hyaline, sluggish bodies were seen in each preparation. There seemed to be no increase in number in the succeeding examinations.

27*th*. The blood obtained upon this date differed in no respect from that taken four days previously. The bodies were clearly hyaline in the fresh blood, and in the stained spreads a few were seen intracellularly and faintly pigmented.

The irregularity in the size of the erythrocytes still persisted, while an occasional normoblast was seen. Apparent vacuolation of the red cells was also observed. Hæmoglobin, 47 per cent. (Dare's hæmoglobinometer); erythrocytes, 2,240,000; leukocytes, 6600. Differential count of the leukocytes was: polymorphonuclear, 66 per cent.; lymphocytes, 25.5 per cent.; hyaline cells, 6.5 per cent.; eosinophiles, 2 per cent. None of the leukocytes contained pigment granules.

30*th*. Spreads made upon this date contained the same bodies in about the same condition as in the previous examinations, mostly oval and extracellular, but a few were intracellular. Microcytes and macrocytes, phantom cells, apparently vacuolated erythrocytes, and an occasional normoblast were demonstrable. A few erythrocytes were seen taking the form of a four-leafed clover.

Some brief comment may be made upon the findings as thus detailed and as exhibited in the slides now under the microscopes.

Our blood picture may be summarized as follows: hæmoglobin, below 50 per cent.; erythrocytes, averaging 2,000,000; leukocytes, averaging between 7000 and 8000; poikilocytosis, microcytosis, and macrocytosis, presence of normoblasts, a few megaloblasts, phantom cells, and the appearance of small, oval, circular intracellular and extracellular bodies, which, in a small number, are very lightly pigmented.

In most respects the blood changes here recorded resemble those of Banti's disease or splenic anæmia, the chief differences being in the small number of nucleated reds found in this case and the absence of marked leukopenia. The low percentage of hæmoglobin, the small number of erythrocytes, the presence of poikilocytes, microcytes, macrocytes and phantom cells, all point to this

malady. Also the hæmatemesis and enterorrhagia are symptoms which clinically suggested Banti's disease. These latter conditions may have arisen from pressure bringing about congestion as a result of enlargement of the spleen. It is possible that we may be dealing with both maladies—*i. e.*, Banti's disease and malaria.

In morphology, the small bodies while not conforming to a typical malarial parasite, may represent, as Manson says, "moribund or fragmented forms." (These are mechanically freed parasites expressed from blood corpuscles by the compression to which the blood is subjected between slip and cover glasses. Frequently, these artificially freed parasites are broken into small fragments, and becoming free in the liquor sanguinis, assume a spherical or disk-like form. The protoplasm becoming diffluent, the pigment is resolved into a number of minute dust-like particles possessing active brownian movement.) The intracellular forms are no doubt malarial parasites.

Golgi describes as quinine forms of the malarial parasite certain rounded, immobile bodies with clumped pigment and sharp irregular outline, and deformed segmenting bodies deficient in the number of spores.

Ewing has observed in cinchonized cases half-grown forms numerously subdivided and deficient in chromatin.

That these bodies are piroplasma (Leishman-Donovan) seems doubtful, as the latter possess a micronucleus and macronucleus, are extremely small, are rarely, if ever, situated intracellularly (red cells), and are never found in the peripheral circulation.

According to most observers, the leukocytes in malaria do not increase in number, usually remaining below 10,000, and the polynuclear cells are most numerous in differential counts made.

Lymphocytosis may also occur in some cases. In pernicious malaria as low as 40 per cent. of polynuclear cells has been found by Bastianelli.

Various changes in the erythrocytes have been noticed by many observers. Oligocythæmia, erythropyknosis, granular degeneration, as well as phantom cells, macroblasts and microblasts have been observed. Ewing states that, as a rule, in cases of moderate severity there are changes in the red cells as noted in secondary anæmia. Hæmoglobin is also lowered in percentage.

In the case herein reported, there was never what might be called a marked leukocytosis, no lymphocytosis, nor was there ever evidence of pigment or the presence of any of the parasites in any of the leukocytes.

Throughout the differential counts made the polynuclear forms were most abundant. An occasional nucleolus eccentrically situated in one or two hyaline cells, and buds of protoplasm from lymphocytes were present. Occasionally a cell, reacting like a plasma cell, was found. The red cells in the first count were slightly less

than 2,000,000; in the second and third counts there were between 2,000,000 and 3,000,000. Large clusters of small, irregularly oval granular bodies, some reacting positively to the basic dye, others to the acid dye; some intracellular and others extracellular, represented in all probability degenerating blood platelets. They were in excessive numbers.

THE LEUKOCYTOSIS OF PREGNANCY, OF THE PUERPERIUM, AND OF ECLAMPSIA.

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Despite the numerous observations already published upon the leukocytosis of pregnancy and of the puerperium, it has seemed to us permissible to add our results to those of others, because of the very considerable variation in the reports of the different observers and because we wished to establish, for ourselves, a definite basis for the estimation of the leukocytosis of eclampsia.

1. The Leukocytosis of Pregnancy. The results given below are based upon 50 cases in the ninth month of pregnancy:

Average count	10,600
Highest count	18,400
Lowest count	5,400
Average in primiparæ	11,854
Average in multiparæ	9,346
Absence of leukocytosis	9

These counts were all taken on patients who were perfectly normal and were made from four to five hours after the mid-day meal, in order to eliminate, as far as possible, the question of digestive leukocytosis.

Digestive Leukocytosis in the Ninth Month of Pregnancy. It has been claimed by at least one observer, Rieder (Ewing), that in the ninth month of pregnancy there exists not only no digestive leukocytosis, but an actual decrease in the leukocytes.

In 20 cases studied by us the following results were obtained:

Digestive leukocytosis	in 13 cases.
No change	in 1 case.
An actual decrease	in 6 cases.

These counts were made one hour before and three hours after the mid-day meal.

2. The Leukocytosis of the Puerperium. The results given below are based upon 50 cases on the third day of the puerperium.

These cases all ran normal temperatures throughout, and at no time was there odor to the lochia:

Average count	12,400
Highest count	20,400
Lowest count	5,600
Average in primiparæ	13,200
Average in multiparæ	11,600
Absence of leukocytosis	8

The increase in the leukocytes during pregnancy and the early puerperium we believe to be largely due to the natural increase in the metabolic activity of the body at these periods.

3. THE LEUKOCYTOSIS IN ECLAMPSIA. These results tabulated below are based upon the leukocyte counts in 14 consecutive cases of eclampsia treated in this hospital, in the service of Dr. Edwin B. Cragin, during the past few months.

Inasmuch as so little work has as yet been published on this subject, we give the individual leukocyte counts of each of the 14 cases, with a brief synopsis of each case. The condition of the urine in the several cases has been purposely omitted as having no direct bearing upon the subject at hand.

We have divided these cases into three groups, according to the apparent degree of their toxicity.

Group A (mild). CASE 1 (History No. 14110).—Patient developed eclampsia shortly after a normal labor. She had six convulsions the day after labor; her general condition, however, remaining good. Her recovery was uneventful from this time on.

Day of disease.	White blood-corpuscles.	Temperature.
1 post-partum	19,000	98° F.
2 "	18,200	100
3 "	16,000	98
10 "	13,200	100.4
14 "	9,400	99.6

CASE 2. (History No. 14,164).—Patient also developed eclampsia a few hours after labor. On the day of delivery she had three severe convulsions. The next day the patient was quiet and conscious. Convalescence soon set in.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	21,600	98.4° F.
1 post-partum	15,200	99.2
2 "	13,400	99
5 "	8,400	99.2

CASE 3 (History No. 14236).—The patient had four convulsions before admission. An *accouchement forcé* was performed. During the first day after delivery she had nine convulsions. Despite this large number of convulsions, her general condition remained fairly good. On the second day she became conscious and had no further convulsions. There was marked improvement on the third day, and uninterrupted convalescence thereafter.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	17,200	101° F.
1 post-partum	14,600	100.6
2 "	13,600	99.2
3 "	21,200	99.8
6 "	16,400	100
8 "	12,000	99.2
10 "	7,300	98.4

The temperature on the day of delivery was reactionary.

CASE 4 (History No. 14207).—The patient had several convulsions before admission. Her condition was very good for an eclamptic. She had a normal labor. There were no convulsions after delivery. Recovery was rapid.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	16,000	99.4° F.
1 post-partum	14,200	99.8
2 "	11,400	99
5 "	12,000	98.6
10 "	8,400	98.6

This was an especially mild case, and shows well the low leukocytosis in the mild type of the disease.

CASE 5 (History No. 14026).—The patient had six convulsions before admission. An *accouchement forcé* was performed. There were no convulsions after the delivery. Although in poor shape at first, she showed good resistance and convalesced rapidly.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	31,400	99.2° F.
1 post-partum	19,200	99
3 "	17,400	100.6
8 "	15,000	100
11 "	12,000	99.6
20 "	9,000	98.4

CASE 6 (History No. 14473).—The patient had four convulsions before admission. An *accouchement forcé* was performed. No convulsions after delivery. Patient had good resistance and convalesced satisfactorily.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	31,000	100.4° F.
1 post-partum	29,800	99.2
2 "	19,600	99.2
3 "	14,800	99.8
4 "	12,600	99
10 "	9,200	99

Group B (*severe*). CASE 7 (History No. 14147).—Patient had several convulsions before admission; condition very toxic; *accouchement forcé* was performed. She had two convulsions soon after delivery. Twenty-four hours after labor there was general improvement, and convalescence set in. There was, however, a setback on the fourth and fifth days, due, evidently, to increased hepatic irrita-

tion, as evidenced by severe pain in the region of the liver; nausea and slight vomiting of coffee-ground material.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	28,000	99.8° F.
1 post-partum	26,000	100
2 "	27,000	100.2
4 "	45,000	103
5 "	40,400	99
6 "	32,200	99.2
7 "	26,800	99
8 "	16,600	100
9 "	12,200	98.4
12 "	9,800	98.8

The temperature on the fourth day post-partum only lasted for four hours and was evidently due to a sudden, temporary increase in the toxic symptoms of the patient. The uterus was normal. The lochia normal in amount and without odor. The rise of the leukocytes on the fourth day was due to the aggravated condition of the patient.

CASE 8 (History No. 14341).—The patient had several convulsions before admission; appeared very toxic. An *accouchement forcé* was performed. The following day there was considerable improvement; patient was rational at times. The second day there was marked pain in epigastric region, with some distention. The third day patient appeared worse; she vomited frequently small quantities of coffee-ground material. The fourth day the vomiting continued, but was less severe. The sixth day there was general improvement, with no further vomiting. From this time on there was steady improvement.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	36,000	101° F.
1 post-partum	26,600	98.6
2 "	33,200	100.6
3 "	32,000	100
4 "	23,400	99
6 "	23,600	99.4
8 "	19,000	100
10 "	14,000	99.4
14 "	9,200	99

The temperature of the day of delivery was a reactionary one. The rise of leukocytes on the second day after delivery was due to an aggravation of the symptoms.

CASE 9 (History No. 14374).—The patient had five convulsions before admission. She was in labor and was delivered with forceps. There were nine convulsions on the first day after labor; but there were none after that. On the second day after labor, despite the fact that there were no convulsions, the patient's general appearance looked less favorable (this accounts for the rise in leukocytes). On the third day there was a turn for the better, and improvement continued uninterrupted.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	24,800	99.4° F.
1 post-partum	25,600	100.2
2 "	49,800	101
3 "	31,000	99.2
4 "	12,600	98.6
6 "	7,800	98.6

The rise of temperature on the second day was due again to the general toxic condition of the patient. There were positively no uterine symptoms.

CASE 10 (History No. 14513).—There were four convulsions the day of admission. An *accouchement forcé* was performed. Patient looked very toxic, indeed; she continued in bad condition for the following two days, but then began to improve, and convalesced satisfactorily.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	46,000	99.6° F.
1 post-partum	37,600	99.2
2 "	30,000	99.6
3 "	27,200	98
6 "	16,000	98.4
8 "	13,800	98.8
14 "	7,400	98.8

This shows well strong resistance with a high leukocytosis in a severe case.

CASE 11 (History No. 14183).—There were several convulsions before admission. Patient looked very badly. She was delivered with forceps. She had no convulsions after delivery, but all active treatment for two days had to be given with the patient under chloroform, as her condition was one of great irritability. Convalescence then set in and progressed satisfactorily.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	19,800	100.8° F.
1 post-partum	25,200	98
2 "	21,000	99.6
5 "	20,600	99.4
6 "	18,200	99.2
7 "	16,200	99.8
8 "	11,400	100
12 "	8,400	98

This case is given under "Group B," as the patient was, for at least thirty-six hours, in a critical condition, despite the relatively low leukocyte count.

CASE 12 (History No. 14466).—The patient had a large number of convulsions before admission. Her condition appeared very grave. An *accouchement forcé* was performed. There were no convulsions after delivery, but for several days the prognosis was very uncertain. By the sixth day she began to improve rapidly, and was discharged in good condition, although her mind remained slightly clouded

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	54,000	105° F.
1 post-partum	47,000	102
2 "	43,000	98
3 "	38,400	100.8
4 "	34,600	99.2
5 "	31,200	100
6 "	24,600	100.2
8 "	19,000	99.4

The temperature during the first two days was due to the intensity of the disease. The high leukocytosis illustrates well the strong resistance of the patient.

Group C (*very severe*). CASE 13 (History No. 13975).—The patient was admitted in very grave condition. She had several convulsions before entering the hospital and appeared hopeless from the start. An *accouchement forcé* was performed. She died two days after delivery from her toxæmia, having had no convulsions since delivery.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	19,600	100.2° F.
1 post-partum	15,400	99.8
2 "	13,800	99

We see here a case with extreme toxæmia and *poor* resistance and a *low* leukocyte count.

CASE 14 (History No. 14290).—Patient came into the hospital in labor. She developed eclampsia soon after delivery. The day of delivery she had twelve convulsions, and soon appeared deeply toxæmic. On the first day after labor there were no convulsions; the patient was conscious and appeared decidedly improved. On the second day after labor she became markedly worse; there was vomiting of blood and blood in the stools. Death took place on the evening of the second day.

Day of disease.	White blood-corpuscles.	Temperature.
Delivery	26,000	106° F.
1 post-partum	106,000	99.8
2 "	{45,200 / 35,800}	98.4

Here we have a patient with extreme toxæmia and with *good* resistance at first; this resistance, however, suddenly giving away, as is shown by the very rapid fall in the leukocytes.

CONCLUSIONS. While we appreciate the danger of drawing rash inferences from a rather limited number of cases, still, we deem it justifiable to formulate the following from the cases cited above:

1. The toxins of eclampsia cause, in most instances, a leukocytosis. The exact cause of this it is as yet impossible to explain.

2. All things being equal, the degree of the leukocytosis seems to depend very closely upon the degree of toxicity of the patient (*vide* Cases Nos. 3, 4, 10, and 12).

3. The greater resistance of the patient, the higher the leukocytosis (*vide* Cases Nos. 10 and 12).

4. A sudden increase in the leukocytes generally indicates an aggravation of the disease in an individual with good resistance (Cases Nos. 7, 9, and 14 show this especially well).

5. A low leukocyte count in a highly toxic patient is of bad omen (*vide* Case No. 13).

6. A leukocytosis originally high that falls rapidly in a badly toxic patient is likewise a danger signal (*vide* Case No. 14).

7. There is no direct relation between the leukocyte curve and the temperature curve.

REMARKS. 1. These observations were all made with especial care, so as to eliminate any errors of technique. In cases with an unusually high count the determination was verified by a second man.

2. These cases were all devoid of the least evidence of uterine infection.

THE RELATION OF THE ISLANDS OF LANGERHANS TO DISEASES OF THE LIVER, WITH SPECIAL REFERENCE TO CARBOHYDRATE METABOLISM.

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WARTHIN,[1] reporting a case of primary adenocarcinoma of the gall-bladder in which there was marked involvement of the liver by tumor secondaries, directs particular attention to the enlargement of the pancreas in the case. In view of the fact that there was but little evidence of inflammation to be found in the pancreas, he concluded that he was dealing with a true hypertrophy of that organ. Not only does he believe the condition to have been a true hypertrophy, but one compensatory in nature, amending the lost or limited liver function. The islands of Langerhans in this pancreas were from three to five times their usual size.

A case quite similar in anatomical features came to my notice in November, 1901. In it the histological features of the pancreas are almost identical with those in Warthin's case. (See Case I.) At that time my chief interests lay in the consideration of the enlargement of the islands of Langerhans. These structures were carefully measured in sections from various parts of the pancreas. The conclusions then reached concerning the true significance of the hypertrophy of these islands are herewith appended. (See Conclusions 1 and 2.) Nothing further was done with this material until recently,

[1] Philadelphia Medical Journal, July 7-14-21, 1900.

when my interest was reawakened by finding, in one of our Independence Hospital cases, an immense increase in size of the Langerhans' islands, the enlargement being apparently coincident with or subsequent to a marked destruction of the liver parenchyma. (See Case II.)

The study of sections from the liver and pancreas from a number of cases which we have had here since July 1, 1902, also a considerable number of sections of liver and pancreas furnished me by Dr. Ludwig Hektoen from cases in which the liver showed more or less marked involvement by various disease processes, was now undertaken. An attempt will here be made to briefly describe the histological features of the liver and pancreas from such cases as most clearly illustrate the point I wish to make concerning the true significance of the enlargement of the islands of Langerhans. Only the more important anatomical findings will be given, together with a brief description of the gross appearance of the liver and pancreas, in a few cases. The Zeiss micrometer eye-piece was used in making the measurements of the islands of Langerhans. At least five islands of varying sizes were measured in each section and the average then obtained. In none of the following cases was sugar found in the urine:

CASE I.—Mrs. L. T., aged thirty-eight years. Admitted to the service of Dr. T. J. Watkins, Mercy Hospital, Chicago, October 4, 1901; died October 9, 1901. The immediate autopsy was performed by Dr. George de Tarnowsky, and the material was sent to the Department of Pathology, Northwestern University Medical School, where I examined it under the direction of Dr. A. P. Ohlmacher.

Anatomical Diagnosis. Primary adenocarcinoma of gall-bladder, with metastases of liver, lungs, and abdominal, cervical, axillary, and inguinal lymph glands; cholelithiasis; fatty myocarditis; chronic parenchymatous nephritis; ascites.

Liver. The liver weighs nineteen pounds. The surface is studded with yellowish nodules, varying in cross-section from the size of a split pea to a half-dollar piece. Some of the nodules present smooth surfaces and are firm; others are softened and umbilicated. The liver cuts with increased resistance. The incised surface is studded with large and small, discrete and conglomerate tumor nodules. There are many areas of hemorrhagic softening. The bile channels are dilated and apparently filled with bile, giving the liver substance a greenish-yellow hue. The common duct is patent.

Histology of Liver. Epithelial cells in gland-like arrangement, separated by dense bands of fibrous tissue varying in width, are found throughout the liver. Areas of necrosis are frequent; hemorrhagic foci are also of frequent occurrence and widely separated areas of liver cells are found. These cells show more or less degeneration; some of them contain much fat and practically all contain bile pigment. The bile channels are dilated and filled with bile.

Pancreas. The pancreas is large and firm. It cuts with somewhat increased resistance. The cut surface, however, shows no increase of fibrous tissue. The pancreatic duct is patent.

Histology of Pancreas. The interlobular and interacinous tissue is normal in amount. The acini are abundant and are closely packed together. The cells composing them show no degeneration. The islands of Langerhans are everywhere greatly enlarged and well defined. Those in the tail of the pancreas are more abundant and somewhat larger than the ones found elsewhere. The cells composing them are slightly more granular than usual. The measurements of the islands are as follows: largest, 0.4 mm.; smallest, 0.07 mm.; average, 0.255 mm.

CASE II.—Otto J., aged sixty-three years. Admitted to the Independence State Hospital, January 6, 1881; died April 19, 1903.

Anatomical Diagnosis. Chronic valvular endocarditis; double hydrothorax; ancient pleuritis; diffuse carcinomatous infiltration of pylorus, with metastases of liver, lungs, head of pancreas, and abdominal lymph glands; cholelithiasis; obliteration of common bile duct; chronic, diffuse nephritis.

Liver. The liver weighs 2370 grams. It is much firmer than ordinary. A few large and small tumor nodules are scattered over the liver surface, some of them being umbilicated. Hemorrhagic foci, varying greatly in size, are also abundant. The liver cuts with increased resistance. The cut surface shows a few illy-defined tumor nodules, mostly large, a marked increase of fibrous tissue and many hemorrhagic foci. But few lobular markings are to be found. The common duct is obliterated.

Histology of Liver. From various parts of the liver, sections show a very marked increase of fibrous tissue, which has a loose reticulated appearance, or occurs in dense bands. Scattered here and there are epithelial cells in tube-like arrangement. No liver cells were found in any of the sections examined.

Pancreas. The pancreas is somewhat enlarged and quite firm. It cuts with increased resistance. Lying within the interlobular tissue, at the head of the pancreas, small, yellowish foci are seen, averaging about 1 mm. in diameter. The interlobular tissue appears to be slightly increased. Minute, rounded, well-defined foci are seen within the lobules. (These small foci within the lobules, on microscopic examination, are seen to be greatly enlarged islands of Langerhans.) The pancreatic duct is patent.

Histology of Pancreas. In the head of the pancreas considerable increase of interlobular fibrous tissue exists in places, thus destroying many of the acini. In other areas the interlobular tissue is normal in amount. The interacinous tissue is slightly increased. Masses of epithelial cells, resembling those found in the tumor of the pylorus, appear in the interlobular lymph channels. None of these cells invade the lobules. In some places the cells of the acini

show considerable fatty degeneration. The islands of Langerhans are immensely enlarged. Some of them are surrounded with quite dense fibrous tissue capsules. The cells composing these islands are more granular than usual. There is a slight proliferation of fibrous tissue within the interacinous cell groups. Sections taken from the body of the pancreas show a slight increase of interlobular tissue everywhere. The interacinous tissue appears normal. No tumor cells are found in sections from this area. Here, as in the head of the pancreas, the islands of Langerhans are greatly enlarged. Sections made from the tail of the pancreas exhibit the interstitial tissue normal in amount. In this region the islands of Langerhans are uniformly larger and more abundant than elsewhere. No areas of fat necrosis are found. The measurements of the islands of Langerhans are as follows: largest, 0.655 mm.; smallest, 0.095 mm.; average, 0.351 mm.

CASE III.—William R., aged about fifty years. Admitted to the service of Dr. Fenger, Presbyterian Hospital, Chicago. Post-mortem by Dr. Crowder.

Anatomical Diagnosis. Primary carcinoma of gall-bladder; secondary carcinoma of liver and retroperitoneal lymph glands; cholelithiasis; obliteration of common bile duct.

Liver. "The liver is enlarged and firm. Scattered over the surface are large and small tumor nodules. The cut surface everywhere shows many large and small tumor nodules. The interstitial tissue is seen to be greatly increased. Bile pigment is abundant."

Histology of Liver. Sections from various parts of the liver show well-defined rounded areas of epithelial cells in gland-like arrangement. About these areas fibrous tissue is abundant. The interlobular tissue is universally increased. The remaining columns of liver cells are compressed, appear granular, contain bile pigment, and occasionally considerable fat. The central veins and tributaries are dilated and congested.

Pancreas. The pancreas is quite large and firm. It cuts with increased resistance. The pancreatic duct is patent.

Histology of Pancreas. In some areas the interlobular tissue is greatly increased, forming wide compact bands. The interacinous tissue is also increased, though to a degree less than the interlobular tissue. Where the fibrous tissue is most abundant no acini are found, but an island of Langerhans, or frequently several Langerhans' islands closely packed together, still remain. These islands are surrounded by dense fibrous bands. The most of the islands throughout the pancreas are very large. In some there is a very slight increase of fibrous tissue. Except for this, and the fact that the cells composing them are more granular, they appear normal. In certain areas from various sections of the pancreas the interlobular tissue is not so markedly increased. The acini in such areas appear normal, and the fibrous tissue around and within the islands

of Langerhans is not increased. The measurements of the islands of Langerhans are as follows: largest, 0.57 mm.; smallest, 0.171 mm.; average, 0.335 mm.

CASE IV.—William P., aged forty-nine years. Admitted to the service of Dr. James B. Herrick, Cook County Hospital, Chicago. Post-mortem by Dr. Hektoen.

Anatomical Diagnosis. Acute, general tuberculosis of lungs, kidneys and retroperitoneal lymph glands; right fibrinous pleuritis; nodular sclerosis of aorta; cirrhosis of liver; cholelithiasis; ascites.

Histology of Liver. The interlobular and intralobular tissue is much increased. Within this tissue lymphoid cells are abundant. The intercellular capillaries are dilated. Some of the liver cells in the lobules have entirely disappeared. The cords of liver cells remaining are atrophic, widely separated, and show a granular degeneration.

Histology of Pancreas. The interlobular and interacinous tissue is only slightly if at all increased. A few lymphoid cells are present in the interacinous tissue. Many of the groups of acini seem to be undergoing a transition into islands of Langerhans, such as has been described by Lewaschew and others.[1] Areas of post-mortem digestion are seen. The islands of Langerhans are very prominent and abundant. The cells composing them are large, closely packed and granular. The capillaries within these islands are slightly dilated. The measurements of the islands of Langerhans are as follows: largest, 0.341 mm.; smallest, 0.114 mm.; average, 0.237 mm.

CASE V.—Kannute E., aged seventy years. Admitted to service of Dr. Danielson, Norwegian Hospital, Chicago. Post-mortem by Dr. H. G. Wells.

Anatomical Diagnosis. Advanced, atrophic cirrhosis of liver; primary carcinoma and multiple adenoma of liver; chronic interstitial nephritis; fibrous myocarditis; general arteriosclerosis; pericholecystitis; perityphlitis; cholelithiasis.

Histology of Liver. There is a marked increase of interlobular tissue, which contains many lymphoid cells. Numerous small well-defined areas of cells in gland-like arrangement are found in various sections of the liver. Within and about such areas the liver cells are destroyed. The remaining liver cells are granular, and a few show fatty degeneration. The bile ducts appear to be increased in number. The areas of cells found in this liver which show the gland-like arrangement have been described by H. G. Wells,[2] in this case, as primary carcinoma, and in some of them it is possible to make out a transition of the liver cells into the adenomatous tumor structure Wells describes.

Histology of Pancreas. The interlobular tissue appears about normal in amount. The interacinous tissue shows a very slight and

[1] Opie. Diseases of the Pancreas, pp. 81–85.

[2] THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, No. 3, vol. CXXVI. pp. 403–417.

uniform increase; it contains some lymphoid cells. The islands of Langerhans are prominent, and are closely packed with their characteristic cells. The lumina of many of the acini are filled with homogeneous material staining light red with eosin. The measurements of the islands of Langerhans are as follows: largest, 0.361 mm.; smallest, 0.228 mm.; average, 0.324 mm.

CASE VI.—William Z., aged fifty-three years. Admitted to the service of Dr. Billings, Presbyterian Hospital, Chicago. Post-mortem by Dr. Crowder.

Anatomical Diagnosis. Chronic interstitial nephritis; hypertrophic cirrhosis of liver and spleen; chronic localized peritonitis and perisplenitis; hydrothorax; hydropericardium; ascites.

Histology of Liver. The interlobular tissue is markedly increased; lymphoid cells are abundant. The liver cells are atrophic, granular, and occur in small, isolated masses.

Histology of Pancreas. The interlobular and interacinous tissue is normal in amount. The islands of Langerhans are large, but not very abundant. The cells composing them are granular and closely packed. Areas of post-mortem digestion are seen in various parts of the sections examined. The measurements of the islands of Langerhans are as follows: largest, 0.304 mm.; smallest, 0.095 mm. average, 0.209 mm.

CASE VII.—Mary T., aged seventy years. Admitted to the Independence State Hospital August 9, 1902; died November 14, 1902.

Anatomical Diagnosis. Chronic endocarditis; fatty myocarditis; localized, double, old pleuritis; congestion of lungs; fatty degeneration of liver, with slight cirrhosis; pericholecystitis; obliteration of common bile duct; chronic diffuse nephritis; scirrhous carcinoma of left breast, with extension into left axillary glands.

Histology of Liver. The interlobular tissue is considerably increased. The central veins and tributary capillaries are much engorged with blood and dilated. The liver cells are shrunken, granular, and those near the periphery of the lobules are fatty.

Histology of Pancreas. The interlobular tissue is slightly increased. In some areas the interacinous tissue is slightly increased. There is much fat between the lobules. Here and there numerous lymphoid cells are found in the interlobular tissue. The acini are normal in appearance. Most of the islands of Langerhans are immensely enlarged. The cells composing them are granular. There is no proliferation of fibrous tissue within them. About some of these structures the fibrous tissue is considerably increased. The measurements of the islands of Langerhans are as follows: largest, 0.608 mm.; smallest, 0.19 mm.; average, 0.399 mm. The enlargement of the islands of Langerhans in this pancreas seems greater than the involvement of the liver would warrant.

CASE VIII.—Norman M., aged ninety years. Admitted to the Independence State Hospital August 27, 1896; died October 21, 1902.

Anatomical Diagnosis. Fibrous myocarditis, with dilatation of right ventricle and auricle; sclerosis of coronary arteries; chronic, valvular endocarditis, with insufficiency of aortic valve; localized, double, old pleuritis; arteriosclerotic atrophy of kidneys; cyanotic induration and senile atrophy of spleen; general arteriosclerosis.

Histology of Liver. The interlobular tissue is slightly increased. In some areas the intralobular tissue is increased. Many of the liver cells show slight fatty changes and cloudy swelling. Bile pigment is present in considerable amount. The hepatic cells surrounding some of the bile channels are necrotic.

Histology of Pancreas. There is a slight but uniform increase of interlobular and interacinous tissue. A few lymphoid cells are found in this tissue. The bloodvessel walls are considerably thickened. Interlobular fat is increased in amount. The islands of Langerhans are large and some of them are surrounded by slightly thickened bands of fibrous tissue. The cells of the islands are more granular than normal, but otherwise appear unaltered. The measurements of the islands of Langerhans are as follows: Largest, 0.323 mm.; smallest, 0.133 mm.; average, 0.247 mm.

CASE IX.—Elizabeth K., aged seventy-two years. Admitted to the Independence State Hospital April 5, 1902; died July 26, 1902.

Anatomical Diagnosis. Fibrous myocarditis; old pleuritis; general arteriosclerosis; papillomatous cystoma of right ovary, with abdominal metastases; ascites; induration, fatty degeneration and senile atrophy of liver; arteriosclerotic atrophy of kidneys; chronic pachymeningitis and leptomeningitis.

Histology of Liver. There is a slight increase of interlobular and intralobular tissue. The central veins and tributaries are dilated. The cords of liver cells are atrophic and granular. Many hepatic cells show fatty degeneration. Those about the central veins are quite generally destroyed.

Histology of Pancreas. In some places the interlobular tissue is slightly increased. In all but one area the interacinous tissue is of normal amount. One lobule is almost entirely replaced by newly formed fibrous tissue containing many lymphoid cells. Within this lobule are several islands of Langerhans, in which the connective tissue is slightly increased. Most of the islands of Langerhans throughout the pancreas are very large, and the cells composing them are granular. Otherwise they appear unaltered. Some of the cells of the acini show fatty degeneration. The measurements of the islands of Langerhans are as follows: largest, 0.38 mm.; smallest, 0.095 mm.; average, 0.25 mm.

CASE X.—Phœbe P., aged sixty-four years. Admitted to the Independence State Hospital May 23, 1898; died August 8, 1902.

Anatomical Diagnosis. Hypertrophy of left ventricle of heart; chronic mitral and aortic endocarditis; old right-sided pleuritis; fatty degeneration of liver; diffuse meningeal hemorrhage.

Histology of Liver. The liver cells everywhere show a marked degree of fatty degeneration, many of them being greatly vacuolated. Bile pigment is of frequent occurrence within the cells. Areas in which the liver cells have entirely disappeared are scattered throughout various sections examined.

Histology of Pancreas. The interlobular and interacinous fibrous tissue appears normal in amount. The islands of Langerhans are numerous, enlarged, and the cells composing them are granular. Here and there are large and small areas of acini apparently undergoing a transformation into interacinous cell groups. The capillary bloodvessels are everywhere engorged with blood and can be traced about the acini and into the islands of Langerhans. The arrangement of the capillary bloodvessels about the columns of cells in the islands of Langerhans is identical with that about the acini. The measurements of the islands of Langerhans are as follows: largest, 0.323 mm.; smallest, 0.114 mm.; average, 0.218 mm.

CASE XI.—Helen E., aged forty-one years. Admitted to the Independence State Hospital June 20, 1902; died August 7, 1902.

Anatomical Diagnosis. General anæmia; fatty degeneration of liver; punctate hemorrhage of liver (a case of pernicious anæmia).

Histology of Liver. The central veins and tributaries are dilated. The cords of liver cells are quite generally atrophic and in some places have entirely disappeared. Many of the remaining liver cells are somewhat fatty and contain bile. All of them are more or less granular. Many leukocytes are found in the capillary bloodvessels. A few small areas of hemorrhagic necrosis are found.

Histology of Pancreas. The interstitial tissue is normal in amount. The islands of Langerhans are much enlarged. The cells composing them are somewhat granular and are closely packed. The measurements of the islands of Langerhans are as follows: largest, 0.399 mm.; smallest, 0.114 mm.; average, 0.264 mm.

CASE XII.—Mark C., aged twenty-eight years. Admitted to the Independence State Hospital August 30, 1902; died October 29, 1903.

Anatomical Diagnosis. Acute miliary tuberculosis of lungs, liver, spleen, and kidneys.

Histology of Liver. The liver cells show much fatty degeneration. Areas of necrosis are of frequent occurrence. Typical histological tubercles are also found. The interlobular and intralobular bloodvessels are engorged with blood.

Histology of Pancreas. The fibrous tissue is normal in amount. The islands of Langerhans are abundant, mostly large, and are closely packed with their characteristic cells. The measurements of the islands of Langerhans are as follows: largest, 0.368 mm.; smallest, 0.134 mm.; average, 0.227 mm.

CASE XIII.—Helen K., aged forty-five years. Admitted to the Independence State Hospital April 8, 1902; died February 11, 1903.

Anatomical Diagnosis. Atrophy and fatty degeneration of heart; tuberculous bronchopneumonia; tuberculosis of peribronchial and mediastinal glands; old, right-sided, obliterating pleuritis; old, left-sided, localized pleuritis; amyloid infiltration of spleen; fatty degeneration of liver; chronic diffuse nephritis; tuberculous ulceration of small intestine, cæcum, and ascending colon.

Histology of Liver. The central veins and tributaries are much dilated and engorged with blood. There is marked fatty degeneration of the liver cells, especially at the periphery of the lobules. A pink-staining, homogeneous material is seen to occupy many of the cells throughout the various sections examined.

Histology of Pancreas. The fibrous tissue is normal in amount. The islands of Langerhans are very abundant and large. The cells composing them are granular. The capillary bloodvessels of these islands are slightly congested. The measurements of the islands of Langerhans are as follows: largest, 0.475 mm.; smallest, 0.095 mm.; average, 0.26 mm.

CASE XIV.—Amelia L., aged thirty-six years. Admitted to the Independence State Hospital March 3, 1899; died November 9, 1902.

Anatomical Diagnosis. Old pleuritis; parenchymatous degeneration of heart muscle; chronic pulmonary tuberculosis; amyloid infiltration of spleen, liver, and kidneys; parenchymatous degeneration of pancreas; tuberculous ulceration of ileum and colon; tuberculosis of mesenteric glands.

Histology of Liver. Almost all the liver cells seen in the various sections contain a homogeneous material, staining pink with eosin, blue with Mallory's aniline-blue stain, and mahogany-red with Lugol's solution. But little evidence of fatty degeneration is seen.

Histology of Pancreas. The fibrous tissue is normal in amount. The cells of the acini show slight degree of fatty degeneration. The islands of Langerhans are large, numerous, well defined, and closely packed with their characteristic cells, which are more granular than usual. The bloodvessels of the pancreas are slightly congested. The measurements of the islands of Langerhans are as follows: largest, 0.465 mm.; smallest, 0.095 mm.; average, 0.29 mm.

CASE XV.—Christian K., middle aged. Admitted to the Independence State Hospital February 7, 1899; died August 14, 1902.

Anatomical Diagnosis. Diffuse purulent peritonitis; tuberculous perforation of ileum; double pulmonary tuberculosis; amyloid infiltration of liver and spleen.

Histology of Liver. The liver cells have largely given place to a homogeneous material, staining pink with eosin and answering to the various tests for amyloid. The interlobular tissue is somewhat increased.

Histology of Pancreas. The fibrous tissue is normal in amount. A few lymphoid cells are found within this tissue. The cells of the

acini show some cloudy swelling and slight fatty degeneration. The islands of Langerhans are abundant, large and well defined. The cells composing them are granular and closely packed. The measurements of the islands of Langerhans are as follows: largest, 0.38 mm.; smallest, 0.114 mm.; average, 0.241 mm.

Besides the cases of which a brief description has been offered, 25 additional ones are herewith tabulated. An endeavor has been made to classify these cases according to the degree of involvement of the liver by disease processes, separating those in which there is an increase of fibrous tissue in the pancreas from such as present a normal amount of interstitial structure.

TABLE ILLUSTRATING ENLARGEMENT OF THE ISLANDS OF LANGERHANS FOLLOWING DISEASES OF THE LIVER. SUPPLEMENTAL TO CASES ALREADY GIVEN.

Marked chronic passive congestion of liver. Pancreas normal.

Age.	Largest island.	Smallest island.	Average size of islands.	Remarks.
48	0.304 mm.	0.100 mm.	0.2118 mm.	Very abundant.
39	0.342 "	0.067 "	0.207 "	Fairly "
39	0.380 "	0.190 "	0.2327 "	Very "
75	0.368 "	0.080 "	0.2034 "	" "
60	0.368 "	0.100 "	0.2208 "	" "
Average total	0.352+mm.	0.107+mm.	0.215 + mm.	

Marked chronic passive congestion of liver. Increase of fibrous tissue in pancreas.

Age.	Largest island.	Smallest island.	Average size of islands.	Remarks.
74	0.323 mm.	0.114 mm.	0.2217 mm.	Abundant.
40	0.323 "	0.100 "	0.2095 "	Fairly abundant.
67	0.335 "	0.08 "	0.1994 "	Abundant.
Average total	0.327 mm.	0.098 mm.	0.21 + mm.	

Slight chronic passive congestion of liver. Pancreas normal.

Age.	Largest island.	Smallest island.	Average size of islands.	Remarks.
80	0.268 mm.	0.134 mm.	0.201 mm.	Scarce.
61	0.301 "	0.100 "	0.2018 "	Fairly abundant.
54	0.285 "	0.133 "	0.109 "	" "
Average total	0.284 mm.	0.122 mm.	0.17 mm.	

Slight chronic passive congestion of liver. Increase of fibrous tissue within pancreas.

Age.	Largest island.	Smallest island.	Average size of islands.	Remarks.
63	0.285 mm.	0.095 mm.	0.209 mm.	Fairly abundant.
88	0.285 "	0.095 "	0 219 "	Very "
48	0.304 "	0 095 "	0.204 "	Fairly "
71	0.234 "	0.100 "	0.178 "	Scarce.
Average total . .	0.277 mm.	0.096+mm.	0.202 + mm.	

Focal necrosis of liver in case of streptococcus septicæmia. Acute interstitial pancreatitis.

Age.	Largest island.	Smallest island.	Average size of islands.	Remarks.
71	0.285 mm.	0.095 mm.	0.171 mm.	Abundant.

Considerable fatty degeneration of liver. Pancreas normal.

Age.	Largest island.	Smallest island.	Average size of islands.	Remarks.
43	0.285 mm.	0.095 mm.	0.182 mm.	Abundant. (See text.)

Slight passive congestion and acute parenchymatous degeneration of liver. Slight acute interstitial pancreatitis. (Case of uræmia.)

Age.	Largest island.	Smallest island.	Average size of islands.	Remarks.
26	0.456 mm.	0.19 mm.	0.327 mm.	Abundant. (See text.)

Liver practically normal. Pancreas normal.

Age.	Largest island.	Smallest island.	Average size of islands.	Remarks.
54	0.214 mm.	0.08 mm.	0.1623 mm.	Scarce.
42	0.268 "	0.067 "	0.1925 "	Fairly abundant.
26[1]	0.234 "	0.067 "	0.1088 "	Scarce.
53	0.228 "	0.095 "	0.1596 "	"
Average total . .	0.236 mm.	0.077 mm.	0.155 + mm.	

[1] This case is the only one of this particular series in which the liver shows no chronic changes.

Liver practically normal. Slight increase of fibrous tissue within pancreas.

Age.	Largest island.	Smallest island.	Average size of islands.	Remarks.
63	0.201 mm.	0.05 mm.	0.131 + mm.	Fairly abundant.
74	0.234 "	0.08 "	0.16 + "	" "
25[1].	0.201 "	0.10 "	0.117 + "	Scarce.
Average total . .	0.212 mm.	0.076+mm.	0.136 mm.	

By referring to the above table, it will be noticed that 8 cases are given in which the liver shows the changes of marked, chronic passive congestion. In 5 of these the fibrous tissue of the pancreas was normal in amount, while in 3 it was slightly increased. It will also be noticed that in those cases in which the fibrous tissue was normal in amount the islands of Langerhans, except in 1 case, were somewhat larger than those found in the 3 cases in which the fibrous tissue was increased. Thus, it will be apparent that chronic inflammatory changes could have had but little or no influence in the causation of the enlargement of these interacinous cell groups. This also holds true in a considerable number of other cases, as, for instance, Cases I., V., VI., IX., X., XI., XIII., and XV.

In 1 case (see table) the liver showed considerable fatty degeneration, and the islands of Langerhans did not appear to have enlarged to any considerable degree, though they were more abundant than usual. In this case we would expect, in view of the findings in the various cases above cited, that such a degree of liver involvement would be accompanied by enlargement of the interacinous cell groups of the pancreas. Possibly the fatty changes found in the liver of this case were of an acute type, and the islands of Langerhans had as yet failed to respond to the additional work thrown upon them because of the diseased condition of the liver. In another case (see table) the liver showed but a slight passive congestion and acute parenchymatous degeneration. There was a beginning acute interstitial pancreatitis. In this case the islands of Langerhans were greatly enlarged and numerous. Here the involvement of the liver is so slight that it cannot be held responsible for the great enlargement shown by the islands of Langerhans. The cause of death in this case was acute uræmia, the patient being a woman aged twenty-six years. Perhaps this condition may be held accountable for the phenomenon presented by the islands of Langerhans. While these 2 cases offer an exception to the rule established by our other examples, their number alone would seem insufficient to offer any valuable proof contrary to the point I wish to make regarding the relation of the islands of Langerhans to the diseases of the liver.

[1] This case is the only one of this particular series in which the liver shows no chronic changes.

That the relation between a diseased liver and hypertrophy of the islands of Langerhans is a close one is shown by the fact that in practically all of our cases the hypertrophy of these islands is proportionate to the degree of liver disease. The great abundance of the islands of Langerhans in many of these cases seems of importance as suggesting the ability of these structures to multiply. In fact, in some cases a transformation of the acinous glands into interacinous cell groups is apparently taking place. Opie does not believe it possible for the acinous cell groups to become converted into islands of Langerhans, as he was unable to prove, by animal experiments, that such a phenomenon really occurs. He also believes that the apparent increase in number of the islands of Langerhans seen in various cases is only a relative one due to the presence of unusual amounts of fibrous tissue, which, causing the atrophy of the individual lobules, brings the islands closer together, thus giving them the appearance of having multiplied. While this is probably true in many cases, it is not so in all, for occasionally I have found a pancreas with a normal amount of fibrous tissue in which the islands of Langerhans were very abundant.

Cases II., III., and VI., in which abundant fibrous tissue is seen around greatly enlarged, though otherwise unaltered, interacinous cell groups, not only illustrates Opie's observations as to the wonderful resistance these islands show toward inflammatory processes, but suggests the probability of these islands having enlarged before any marked increase of fibrous tissue had taken place about them. It would appear to be a mechanical impossibility for these structures, made up as they are by epithelial cells supported by a delicate framework of capillaries, to enlarge if hampered on all sides by fibrous tissue bands of increased thickness and density. Assuming that the enlargement of the islands of Langerhans is subsequent to the impairment of the liver function, we are safe in the deduction that the hepatic disease occurred some time before the involvement of the pancreas in the cirrhotic process, or, at the most, before the cirrhotic process in this viscus had become at all marked.

In almost all of the cases the cells of the islands of Langerhans are very abundant and somewhat more granular than usual. I am inclined to interpret this as due to an increased activity on the part of these structures, especially as Ssobolew has shown, after feeding dogs on carbohydrates, that the cells of the islands of Langerhans become granular, probably due to the increased demand placed upon them. In 7 cases (see table) the liver is stated as being practically normal. In all but 2 of these cases, however, some slight chronic changes are found. In these two exceptions the livers present only a slight degree of cloudy swelling.

I have, of course, not lost sight of the necessity of studying normal liver and pancreas to obtain a basis for comparison, so far as the material available to my purpose permits. The only reference to

the size of the normal islands of Langerhans that has been found is in Kölliker's *Handbuch der Gewebelehre des Menschen.*[1] Here the normal diameters of these structures are given as varying from 0.07 mm. to 0.3 mm. Unfortunately, no *average* measurement is given. The statement is made that the islands of Langerhans vary much in size and numbers; in some cases being small and scarce, in others being large and abundant. It seems probable, in those cases in which the islands of Langerhans are large and numerous, Kölliker was dealing with abnormal conditions. It appears wholly improbable that such a degree of enlargement as 0.3 mm. is ever attained by these structures except under abnormal conditions, such, for example, as that described in this text.

We may now enter upon the consideration of the significance of the enlargement of the islands of Langerhans in the above-cited cases. That this enlargement is a true hypertrophy, and, further, an hypertrophy compensating for some lost or limited liver function, subsequent to disease processes in that viscus, is highly probable. Opie's observations have shown that, in so far as the pancreas is concerned, the carbohydrate function is controlled by the islands of Langerhans. Furthermore, this seems to be their *sole* function. This being the case, a compensatory hypertrophy on their part can only be brought about by an impairment of a similar or complimental function on the part of some other organ or organs. Since the discovery of Claude Bernard in 1853, that the liver normally contains as much as 40 per cent. of glycogen, abundant clinical and experimental evidence has demonstrated the very important carbohydrate function possessed by this organ. The function of the liver, of converting the carbohydrates of ingestion and the sugars of digestion into glycogen and there to retain this product for the body's future use, together with its property of reconverting this glycogen into sugar (dextrose and levulose), supplying it to the blood according to the tissues' needs, is fully established. The sugar content of the blood (about 0.02 per cent.) is thus regulated. With the above facts in view, many observers believe (though less than formerly) that with a perverted glycogenic function of the liver, glycosuria, and not infrequently diabetes, results.

"Two theories concerning the role the liver plays in the causation of glycosuria have arisen. One theory supposes a depressed glycogenic function in the liver: that the liver cells are unable to convert the digestive sugars (dextrose and levulose) brought to them by the portal blood into glycogen, and that in consequence sugar accumulates in the blood (hyperglycæmia) in greater quantities than can be made use of by the tissues, to be thrown off through the kidneys as waste."[2]

[1] Sehste Auflage, dritter Band, 1899, p. 253.

[2] Loomis and Thompson's Medicine, vol. iii. p. 838.

The other theory supposes an inability on the part of the liver cells to properly retain the sugars after they have been formed into glycogen, that is, the glycogen is too rapidly changed into dextrose and levulose for the body's use, and is, therefore, thrown into the blood stream, there to accumulate in abnormally large amounts, with the usual results. Diabetes has been attributed to various diseases of the liver, such as atrophic cirrhosis, hypertrophic cirrhosis, pigmentary cirrhosis, and chronic fatty degeneration. So far as I am able to learn, no case of amyloid liver nor neoplasms of the liver has been held responsible for the occurrence of the diabetes.

Lesle and Marklen[1] found diabetes present in several cases in children suffering from chronic gastroenteritis, and ascribed it to faulty hepatic activity. A. Exner,[2] in the study of cholelithiasis, found sugar present in the urine in all but 1 of 40 cases examined, the sugar disappearing after operation for the removal of gallstones. Zinn and also W. Kausch have investigated this subject, and they, on the contrary, found sugar in but a limited number of such cases. The frequent occurrence of sugar in the urine in considerable quantities, incidental to gallstone colic, has engendered the belief by many authors that it is a sequel to cholelithiasis. It would appear that the occurrence of glycosuria in such cases might well be ascribed to a disturbance of the liver function subsequent to the bile stasis of gallstones.

Minkowski[3] found the glycogenic power of the liver reduced in atrophic cirrhosis, but did not find this to be the case in diseases of the liver in general. By feeding dogs as long as practicable with 3.5 c.c. to 4 c.c. of 90 per cent. alcohol in water, Rosenfeld[4] found the fat in the liver to become greatly increased, while the glycogen was diminished in amount. This indicated that the alcohol exerted an influence upon the glycogen-retaining function of the liver cells. It is not improbable that the fatty changes in the liver of these cases were primary, and that the glycogenic function was impaired as a result of this pathological condition. The glycogen store of the liver is found to be lessened in starvation, in fever, after injections of acid into the bile-ducts, in diabetes of man, and after extirpation of the pancreas in birds.[5] While it may not be demonstrated that in most diseases of the liver the glycogenic function is impaired, yet it appears likely, with a decreased number of healthy cells, we might expect a limitation of this function, and possibly glycosuria.

[1] Revue mens. des méd. de l'enf., February 1, 1901. Nothnagel's Encyclopedia of Practical Medicine, American edition.

[2] Deutsch. med. Woch., August 4, 1888. American Year Book of Medicine, 1900, p. 93.

[3] Ergebnisse der Allgemeinen Pathologie von Lubarsch und Ostertag, 1897, p. 720. Quoted from Nothnagel's Encyclopedia of Practical Medicine, American edition.

[4] Centralbl. f. inn. Med., October 20, 1900. Nothnagel's Encyclopedia of Practical Medicine, American edition.

[5] Diseases of the Liver, Pancreas, and Suprarenal Glands. Nothnagel's Encyclopedia of Practical Medicine, American edition, p. 408.

That the pancreas and liver are closely related as regards their carbohydrate function is conceded by many observers, notably by Chauveau and Kaufmann. Just what this relation is has never been established, and to my knowledge these cases are the first published as presenting an anatomical evidence of this relation. If Lépine's theory of glycolytic ferment, being elaborated by the islands of Langerhans and from there entering the blood and subsequently the tissues, be tenable, then we might explain the relation in this manner: Assuming that diseases in the liver so impair its glycogenic function that the sugar in the blood is increased, additional labor would be thrown upon the islands of Langerhans in the manufacture of an increased amount of glycolytic ferment to aid in maintaining the normal sugar content of this medium. In order to meet the increased demands thrown upon them, these interacinous cell groups of the pancreas would, of necessity, enlarge. Should they respond promptly and fully, untoward results would probably be averted. If, on the contrary, anything preventing these structures from enlarging and properly assuming their added responsibility, such, for instance, as would likely occur should their growth be impeded by an abnormal amount of fibrous tissue within or around them, we might expect the advent of glycosuria.

Could it be experimentally shown that enlargement of the islands of Langerhans resulted when the sugars of digestion and ingestion were prevented from entering the liver through the portal vein, thus throwing these products into the general circulation, we would have additional proof, I believe, of the correctness of Lépine's theory.[1] Unfortunately, however, experiments in the ligation of the portal vein have proven rapidly fatal to the animals, except geese, operated upon, and in consequence experimental work along this line is largely prohibited.

Another theory is suggested by Herter and Wakeman's[2] recent experiments with adrenalin chloride and other substances in the production of glycosuria. Glycosuria resulted when adrenalin chloride, potassium cyanide, etc., in weak solutions were painted on the surface of the pancreas. The action of these substances on other structures in determining the glycosuria can safely be excluded as being unimportant, in view of these investigators' experiments with potassium cyanide solutions particularly. That the glycogen in the liver was more rapidly converted into sugar in these experiments was abundantly proven. This rapid conversion of the glycogen in the liver to sugar has also been shown to exist in cases of human diabetes, fever, etc., as before mentioned. It seems reason-

[1] Since writing the above the discovery by O. Cohnheim that extracts from either the muscles or pancreas alone are without effect on the oxidation of glucose, but being combined destroy sugar completely, apparently gives support to Lépine's theory, in so far as glycolysis is concerned.

[2] The American Journal of the Medical Sciences, January, 1908, No. 1, vol. cxxv. pp. 46-61.

able to believe that the secretion of the islands of Langerhans exerts an inhibitory influence on the cells of the liver and possibly also the muscles, preventing them from too rapidly converting their glycogen store into sugar, and that the action of the adrenalin chloride and similar substances is just the opposite, augmenting glycogen conversion. It might be argued, in so far as Herter and Wakeman's experiments are concerned, that these substances, when applied to the surface of the pancreas, in some way neutralize the action of the secretion of the islands of Langerhans, thus temporarily destroying its inhibitory influence on glycogen conversion. The idea is also suggested in man and other animals that the normal secretions of the islands of Langerhans and the adrenals are, to a certain extent, antagonistic, and that the normal secretion of the adrenal glands controls the inhibitory influence exerted by the normal secretion of the islands of Langerhans on the liver cells in the conversion of glycogen into sugar. In other words, secretions from these gland structures in normal amounts act upon each other in such a way as to establish a balance in carbohydrate metabolism. On this basis the hypertrophy of the islands of Langerhans in our cases could be explained as follows: With a limitation of the power of the liver cells to retain their glycogen, an additional secretion of the interacinous cell groups of the pancreas is called for to aid them, or the remaining uaffected liver cells, in carrying out this function. These islands respond by enlarging. The influence of the secretion of the islands of Langerhans on the liver cells may be brought about directly or indirectly through the nervous system.

In addition to the cases given above, one of exceptional interest has come to my notice. It was a case of extensive hyaline degeneration of the islands of Langerhans without diabetes. I know of no case on record in which a marked affection of this kind has been found without the occurrence of sugar in the urine. The histological picture presented by the pancreas in this case is very similar to those described by Opie, Wright and Joslin, Herzog and others.

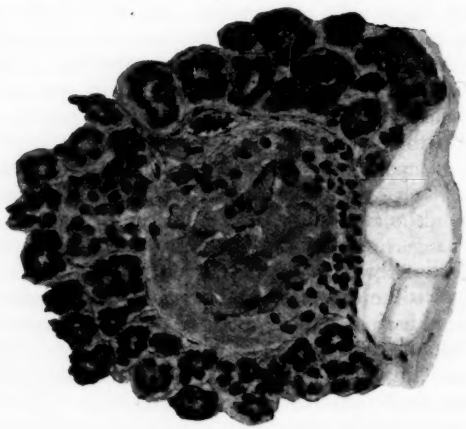
The subject of this case, a male, aged seventy-two years, was admitted to the Independence State Hospital October 30, 1901; he died August 11, 1902. While in the hospital he suffered from a chronic, suppurative mastoiditis with extensive bone necrosis, eventuating in death from extension into the lateral sinus of the side affected. Unfortunately, only two urine analyses were made; one, two days after admission; the other a little more than a week before death. The urine at both examinations was entirely negative. It seems more than likely, however, that had the patient suffered from diabetes at any time while in the hospital, sugar would have been found in his urine at these examinations, and the clinical signs of the disease have been observed. He had no symptoms of diabetes.

The anatomical diagnosis in the case is as follows: Necrosis of the mastoid process of the left temporal bone; septic thrombosis of

the left lateral sinus; double, old pleuritis; congestion of lower lobe of right lung; sclerosis of aorta; sclerosis of aortic and mitral valves; perisplenitis; perihepatitis; interstitial hepatitis; arterio-sclerotic atrophy of the kidneys with cystic degeneration; chronic cystitis.

Histology of Pancreas. Everywhere the interlobular tissue is slightly increased. The interacinous tissue is much increased in some places, having replaced or caused the atrophy of individual acini. In some sections of the pancreas, however, the fibrous tissue appears of normal amount. The islands of Langerhans are abundant and vary greatly in size; the largest island measuring 0.608 mm.; the smallest island measuring 0.057 mm.; the average measurement being 0.244 mm. Within the most of the islands of Langerhans the

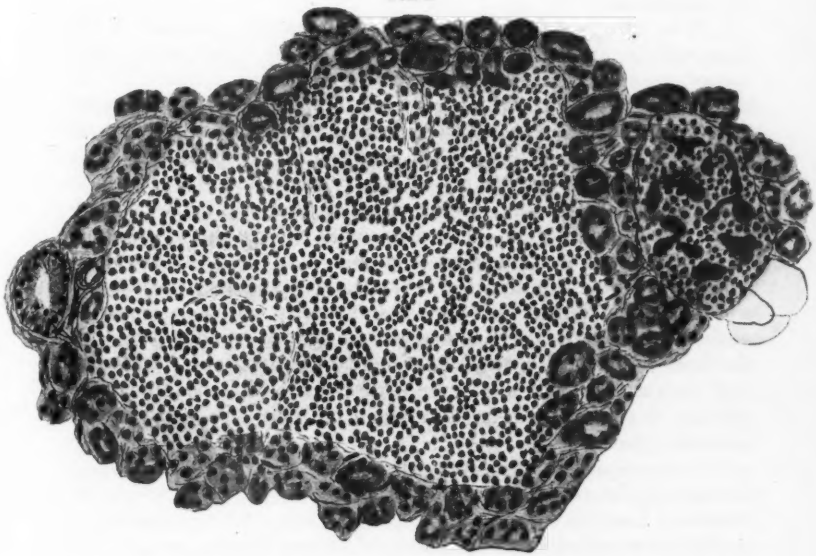
FIG. 1.



fibrous tissue appears normal. Fully four-fifths of the islands contain small isolated or large conglomerate masses of homogeneous substance, staining a bright pink with eosin, cherry-red with Van Gieson's stain, and ultramarine-blue with Mallory's aniline-blue connective-tissue stain. A few of the islands thus affected contain so little of this substance that close observation is necessary to detect it. The most of the islands, however, contain much of this hyaline material, some, in fact, being almost entirely converted into homogeneous masses, appearing not unlike fibrohyaline glomeruli in a fibroid kidney (Fig. 1). This same material is found in the lumina of some of the acini. Not infrequently a greatly affected island is found in close proximity to one entirely normal; these normal ones being, for the most part, very large; the largest island found, for instance, being entirely unaffected (Fig. 2).

The non-occurrence of diabetes in this case may be explained by the assumption that the greatly enlarged, unaffected islands of Langerhans have fully assumed the lost or limited function of the affected ones. The damaged liver may also have had some bearing upon their enlargement. This case not only illustrates that a marked hyaline degeneration of the islands of Langerhans can occur without producing glycosuria, but also furnishes additional proof of the propensity of these structures to undergo a compensatory hypertrophy. There is a possibility that sugar had at some time appeared in the urine, but had disappeared by the assumption of the healthy islands of Langerhans of the additional labor placed upon them.

FIG. 2.



Such a possibility is also suggested in those cases of diabetes in which the sugar content of the urine becomes lessened or even disappears after varying lengths of time. Furthermore, in those cases in which a cure is affected by proper dieting, the *modus operandi* may be explained in a similar way. It has been shown that if patients suffering from certain mild forms of diabetes be placed on a diet entirely free from carbohydrates, the sugar in the urine entirely disappears. Now, if the patient is fed on gradually increasing amounts of white bread along with albumin and fat until sugar begins to appear in the urine, his oxidizing capacity for sugar can easily be determined. Then, if placed on a diet somewhat poorer in carbohydrates than the one which caused the appearance of sugar

in the urine, food richer and richer in carbohydrates may gradually be given until he is able to assume his natural diet. One may assume that during the process of dieting the healthy islands of Langerhans have undergone a sufficient hypertrophy to compensate for the decrease of functional activity in the unhealthy ones.

CONCLUSIONS. 1. Diseases of the liver are generally accompanied by an enlargement of the islands of Langerhans, which is considered a true compensatory hypertrophy.

2. The fact that the liver and the islands of Langerhans have been shown to possess properties which aid in governing the carbohydrate metabolism, suggests that it is the limitation of this function in the liver which is being compensated by the enlargement of the islands of Langerhans.

3. Two theories, at least, concerning the *modus operandi* of this phenomenon, are worthy of consideration. One, based on Lépine's theory, assumes the elaboration of the glycolytic ferment in the islands of Langerhans, which, entering the blood, causes the oxidation of any sugar in excess of the normal amount, and that with an increase of the sugar in the blood resulting from hepatic disease an additional responsibility is placed upon the islands of Langerhans in the elaboration of this ferment, in order that a normal sugar balance may be established. These structures, if healthy, in response to the additional demands placed upon them, undergo hypertrophy. Another theory, suggested by Herter and Wakeman's experiments with adrenalin chloride and similar substances, is that the secretion of the islands of Langerhans possesses an inhibitory influence upon the liver cells in their property of converting glycogen into sugar, and that with a decreased liver activity an additional functional activity of these islands is stimulated, and they, in consequence, become hypertrophied.

4. It is probable that diseases of the liver occur prior to cirrhotic changes in the pancreas, as shown by certain cases in which the islands of Langerhans are greatly enlarged but otherwise unaltered, though surrounded by dense bands of fibrous tissue.

5. It is probable that an increase in the number of islands of Langerhans occurs through a transformation of the acini of the pancreas into these structures, as is seen in a certain number of cases in which the fibrous tissue of the pancreas is not increased, though an unusual abundance of interacinous cell groups are present.

6. Severe involvement of the islands of Langerhans in a hyaline degenerative process may occur without the usual resultant, diabetes. This is explained by the fact, in the one case presented, that the unaffected islands have undergone an immense hypertrophy, thus fully compensating for the lost or limited function of the affected islands.

7. The property the healthy islands of Langerhans possess of undergoing a compensatory hypertrophy explains, in some cases of

diabetes, the lessening and even the final disappearance of the sugar in the urine. This property of the healthy interacinous cell groups of the pancreas also explains the rationale of the treatment in certain mild forms of diabetes by restriction of a carbohydrate diet. The non-occurrence of sugar after return to general diet may be taken as evidence that a sufficient degree of hypertrophy has occurred in the healthy islands of Langerhans.

ORTHOSTATIC ALBUMINURIA.

By Charles Louis Mix, A.M., M.D. (Harvard),
Professor of Physical Diagnosis, Northwestern University Medical School, Chicago.

Physicians who examine large numbers of presumably healthy young adults, as do life insurance examiners and army and navy surgeons, occasionally meet with individuals showing albuminuria; careful physical examination, however, shows none of the cardiovascular changes of nephritis, and microscopic examination of the sediment is entirely negative. I have met with 5 such cases in the last five years, 4 of them having learned of their albuminuria from insurance examiners.

During the last nineteen years, ever since Pavy's[1] first report of 6 cases published in 1885 in the *Lancet*, numerous cases have been recorded in the medical literature of all countries, more especially of Germany and France. Moxon,[2] in England, as early as 1878, reported cases of intermittent and adolescent albuminuria, classifying them into two groups: those showing renal disease, and those not showing it, the latter cases being distinguished by pulses of low tension. T. M. Rooke[3] the same year reported 2 cases, aged fourteen years and sixteen years, respectively, in whom albumin constantly occurred in urine secreted and passed during the day, and in whom it was constantly absent in urine secreted and passed during the night. A similar case, reported by Clement[4] in 1881, showed disappearance of albuminuria after the patient had spent an hour or two quietly in bed. It was Pavy, however, whose paper first gave impetus to the more thorough appreciation of the subject, and he acknowledges Moxon's priority in the report of cases. Pavy reported 6 cases in his first paper, adding 3 more in a second paper the following year. Two of the original 6 cases were kept in sight for a year, 1 at the end of that time being free from albuminuria, the other still showing it. A group of 3 cases, followed for two years, recovered; one case, followed for four years, constantly showed albuminuria. The second series of 3 cases were those of two boys and one girl, the original 6 being men and boys. Pavy discovered that all

9 of his cases showed no albumin on rising, more or less at mid-day, and a trace in the afternoon, lasting till the patient retired. Fasting made no difference in the amount of albumin detected. Pavy, therefore, proposed the term "cyclic" albuminuria, a term which still remains firmly established in medical literature. That the albuminuria is not due to renal disease seemed evident to Pavy, both on account of the entire absence of cardiovascular signs of nephritis and on account of the absence of casts and other pathological findings in the microscopic examination of the urine. Stirling, in 1887, reported a case of which the upright position was constantly associated with albuminuria, and proposed the term "postural" albuminuria. Heubner, from whose service at the Charité Hospital, in Berlin, 7 cases were reported by Schön,[5] recognizing the relation between the upright position and the presence of albumin, proposed the term "orthotic" albuminuria, the albuminuria of the upright position. This term was further improved upon by Teissier (of Lyons), and Merklen, who invented the word "orthostatic" as the descriptive term for the symptom, and French writers uniformly allude to the condition to-day as "orthostatic" albuminuria. In the United States this euphonious term is prevailing, but in England and Germany Pavy's and Heubner's appellations are the more usual ones.

Attempts at classification of these numerous cases meet with failure, because of the fact that orthostatic albuminuria may be a symptom of some form of Bright's disease, notably chronic interstitial nephritis, or may be a condition *per se*. For example, a few cases of chronic interstitial nephritis may show no albumin in nocturnal urine, but may show traces in diurnal urine. Strictly speaking, orthostatic albuminuria is albuminuria from whatever cause, occurring while the patient is standing erect. It is permissible, however, to limit arbitrarily the term to those cases of orthostatic albuminuria in which, upon physical and microscopic examination, there are no signs of renal disease. If there are such signs, then Bright's disease should be diagnosticated, and the accompanying orthostatic albuminuria be alluded to as merely a more or less interesting symptom.

On attempting to classify cases of orthostatic albuminuria with normal cardiovascular systems and normal microscopic findings in the sediment of the urine, in other words, orthostatic albuminuria in the limited sense of the word, we shall find that they fall into the following classes:

1. Intermittent Cases. These cases show an albuminuria continuous for weeks or even months; then stopping for a time, only to reappear after an interval of varying length. In the course of time they seem more likely to develop into Bright's disease than the second group of cases about to be mentioned; indeed, both Bright and Gull have described typical cases of Bright's disease thus insidiously beginning. Followed a few years these cases are likely to

show casts in the urinary sediment. As to age, there are two subdivisions among the intermittent cases:

(*a*) *Adults.* The grown patients with intermittent albuminuria show no distinctive characteristics, morbid or physical.

(*b*) *Children.* The children with intermittent albuminuria are usually cases of post-infectious nephritis, diphtheria, and scarlatina, giving rise to the larger number of cases. It is not essential that the nephritis be the immediate sequel of the infection, cases being reported where an interval of several months has occurred between the time of infection and the time of appearance of the albuminuria.

2. CONTINUOUS CASES. These cases show an albuminuria which is continuous, often for years, never intermitting, and, when finally passing away, doing so never to return. Though they may be of long duration, as a rule, they are transitory. Ewald[6] and others believe that they never develop into cases of true nephritis. As to age, there are two subdivisions:

(*a*) *Adults.* Grown people affected with this sort of albuminuria are almost invariably neurasthenic. So true is this, that the introduction of the term "neurasthenic albuminuria of adults" would not be amiss. As long as the marked vasomotor paresis, so frequent a symptom of neurasthenia, persists, so long does the albumin appear in the urine. The vasomotor paresis has for its best and most reliable symptom the beating of the abdominal aorta, the degree of beating often being so pronounced that the inexperienced for the time entertain the suspicion of abdominal aneurism, the beating being due, however, merely to vasomotor paresis, with a resulting loss in the elasticity of the aortic wall.

(*b*) *Children.* Continuous orthostatic albuminuria in children in large measure is associated with movable kidney, rather than with neurasthenia. The movable kidney is undoubtedly always congenital, and, as a rule, is not associated with splanchnoptosis. Kuttner,[7] out of 62 cases of orthostatic albuminuria of all ages, reports 22 of movable kidney in children, a proportion of 35.5 per cent of all types of cases at any age. Sutherland[8] reports 15 cases of movable kidney in 40 cases of all ages and types, 37.5 per cent. of the total. Relatively, therefore, this subdivision is a large one.

Both of these general divisions of orthostatic albuminuria, the intermittent and the continuous, are "cyclic" in the sense in which Pavy used the word; that is, both show the albumin in largest amounts in the forenoon hours, in smaller amounts in the afternoon and evening hours, and both show the absence of albumin during the night. Both of these general divisions, the intermittent and the continuous, are "orthotic" or "orthostatic," since both show albumin while the body is in the standing or erect posture, and both show the absence of albumin while the body is reclining, whether during the night or during the day. It is evident from my attempts, then, at classification, exactly as Achard[9] states, that orthostatic albu-

minuria is not a nosographical type, sharply demarcated and deserving a description of its own, but is rather a symptom occurring in many different conditions. Moreover, there are cases, which, as Méry and Touchard[10] point out, are continuous during the first few years of their existence, and which subsequently metamorphose into the intermittent type. Where, then, should these cases be classified? We must admit that no hard-and-fast line of demarcation can be drawn between Group 1 and Group 2 of my classification.

Concerning the frequency of occurrence of these cases, some idea may be had from the large numbers reported. For example, Van Noorden reports 154 cases in healthy soldiers in the Netherlands army (Stokvis[11]). Zecthuisen reports 13 cases from an eye clinic. Stokvis reports the case of a superior officer in the Netherlands army in whom albuminuria was accidentally found, and who, on account of it, was kept out of service for months, being finally invalided home. He felt well, and disliked the order exceedingly, but was forced to yield. For several years he was in Stokvis' care, the albuminuria constantly persisting. Stokvis reports other cases. Heubner[5] reports 7 cases; Pavy[1], 9 cases; Edel,[12] 3 cases; Huger,[13] 2 cases. Kuttner,[7] from Ewald's clinic, gathered in ten years 62 cases; Sutherland,[8] 40 cases; Beck[14] reports 1 case; Teissier, numerous cases. In the *Bulletin et mémoires de la Société médicale des hôpitaux* for 1900 and 1901 numerous cases are reported by Teissier, Méry, Achard, Lenoissier, Lemoine, Touchard, Le Noir,[15] and others.

As to the chief etiological factors, Senator[16] states that most cases occur in adolescent girls. Of Sutherland's[8] 40 cases, 30 were females; of Le Noir's[15] 24 cases, 15 were females. On the other hand, 4 of my own cases were males. Of Pavy's 9 cases, 8 were males. Huger,[13] after a study of the literature, reports 88 per cent. of cases in males and only 12 per cent. in females. These diverse statistics may, perhaps, be reconciled, the preponderance of males occurring chiefly in the practice of those concerned in insurance or army examinations, and the preponderance of females in those with a practice in children's diseases, as in Sutherland's and Heubner's cases.

As to the age, Kuttner[7] reports as follows:

3	to 5	years	14 cases.
5	" 10	"	16 "
10	" 15	"	22 "
15	" 20	"	12 "
20	" 25	"	6 "
	29	"	1 case.
	32	"	1 "

Le Noir in 24 cases reports:

Under	10	years	2 cases.
10	to 20	"	10 "
20	" 30	"	5 "
Above	20	"	7 "

The maximum incidence in Kuttner's 62 cases is between the fifth and the fifteenth years, 38 of the cases, or 61 per cent., occurring at that period of life. Ewald,[6] from whose clinic Kuttner's cases were reported, agrees with Kuttner. Huger, who looked up the literature, concludes that most cases occur in adolescence, but notes that instances occur at any age. Pavy's 6 original cases occurred at the ages of eighteen, nineteen, twenty-one, twenty-eight, and forty-nine years; two at nineteen years.

Those who find a majority of cases in children naturally turn to the infectious diseases as a cause. Thus Méry and Touchard report a case in a girl aged fourteen years, following diphtheria and pertussis. Senator agrees that many cases follow the infectious diseases. Even adults may trace the albumin apparently to an infectious disease, Hertz and Salomon[17] reporting a case in a male aged twenty-three years, the albuminuria developing a few months after scarlet fever. Siredey reports a case of post-scarlatinal orthostatic albuminuria of the intermittent form in a young girl. Le Noir, who reports 24 cases of intermittent albuminuria, not necessarily orthostatic, though some of them were of that type, noted that 3 followed scarlet fever, 4 followed typhoid fever, 1 followed puerperal fever, and 5 followed smallpox.

In some cases baths have been thought to have a causal effect in the production of orthostatic albuminuria. Thus Remi Picci and Galewitch report cases apparently due to warm baths (Stokvis[11]); and Ewald[6] admits the possibility. Cold baths are also a cause, just as they are a cause of paroxysmal hæmoglobinuria. Indeed, in these cases it seems as if no hæmoglobinuria resulted, but instead a paroxysmal albuminuria. On the other hand, Edel believes that warm and even cold baths are actually curative in orthostatic albuminuria, since he believes them to promote diuresis.

Exercise and overexertion are apparently not causal factors, every author of note agreeing on this. Pavy's experiments early demonstrated that no increase of albuminuria ever resulted from overexertion. Indeed, Edel goes so far as to propose exercise as a curative measure.

Some cases are hereditary or familial. Thus Schön,[5] reporting cases from Heubner's clinic in 1895, found cases of orthostatic albuminuria in two sisters, one aged fifteen years and one aged thirteen years. Similarly, Achard[9] reports cases in sisters, a girl aged twelve years and one aged eighteen years. Le Noir reports a family consisting of five children, the older sisters showing no albumin and the three boys orthostatic albuminuria, two being twins. The mother had had albuminuria ever since she was seventeen years of age, and had passed through five pregnancies without any impairment of health whatever. Of my own cases, 2 are familial; a father and his nine-year-old daughter show orthostatic albuminuria, the only remaining child being free from it.

The ingestion of food is without influence, according to most observers, from Pavy down, Pavy noting that fasting did not reduce the albumin. Indeed, Edel believes the ingestion of food diminishes the amount of albumin present, and thinks it does so by promoting diuresis. Lenoissier and Lemoine,[18] however, noting that people eat during the day and sleep at night, illogically look upon food as a possible causal factor. Méry and Touchard, in one of their three conclusions summarizing the leading points of their paper, declare that there is an absolute absence of effect upon orthostatic albuminuria by digestive labor. Indeed, the very fact that the maximum albuminuria is before dinner, and that it decreases in the afternoon and evening, when the heavier meals are customarily taken, would seem to indicate the inadequacy of food as a causal factor.

The consensus of opinion is that the erect posture is the chief etiological factor. Concerning the influence of the erect posture in general upon the elimination of water and of urea in the urine, careful experiments by Lenoissier and Lemoine[18] are of interest. These investigators found that standing notably lowers the secretion of water by the kidneys in all individuals, whether healthy or suffering from Bright's disease. The diminution of the quantity of urine passed was found to be greater when the kidneys are diseased than in the healthy state, and the difference is sufficiently marked and sufficiently constant to indicate that excessive orthostatic oliguria is a very delicate sign of defective renal function. The most pronounced reduction that these authors found was 71 per cent. while standing; that is, 29 per cent. as much was secreted standing as lying. If one furthermore measures the excretion of urine during the period of prone posture following the erect posture, a compensatory polyuria will be found. Nevertheless, the quantity of urine secreted in twenty-four hours remains lower than the total which the patient might have secreted had he remained constantly in bed. In a series of patients the average diminution of urine passed in the erect posture was 25 per cent.

Conversely, the erect posture, both in disease of the kidneys and in health, has influence upon the elimination of urea, a greater quantity being secreted in the upright posture, a lesser quantity in the prone position. In the light of these two facts it is not difficult to appreciate the influence which the upright posture may really have upon the elimination of albumin. Moreover, the early experiments of Dukes Clement with his patient, of Pavy with his patients, and of numerous observers since, tend to establish incontrovertibly a close relationship between the upright posture and orthostatic albuminuria. Whether the upright position is the real cause, or whether it is a posture permitting the exercise of a more remote cause, is, of course, not established. That it may not be the real cause is evident from the fact that there is usually a diminution of

albuminuria toward the end of the day, after the patient has been standing the maximum time-length.

Kuttner was the first, I believe, to point out a relationship between movable kidney and albuminuria in young girls. He found the right kidney movable in 22 out of 62 cases, or in 35 per cent. In 19 of these 22 cases both kidneys were movable. Le Noir reports that of his 24 cases, 8 had movable kidneys, or 33 per cent., a figure closely agreeing with Kuttner. All 8 of his cases were females. Sutherland found in a total of 40 cases of orthostatic albuminuria in adolescence, 15 with movable right kidney, in 5 of whom both kidneys were movable. His percentage is, therefore 37.5. Adding these three sets of cases, we find 45 cases of movable kidney in 126 patients, a percentage of 35.7. The average age of Sutherland's patients was ten and a half years, the extreme variations being seven and fourteen years. Since Sutherland's total of movable kidney in the 40 cases of orthostatic albuminuria was greater than found in all the remaining patients of his hospital service during a period of fifteen years, its relationship as expressed by this fact is very important. Sutherland, however, regards the movable kidney as an effect of the orthostatic albuminuria rather than as a cause, his explanation being that the daily surcharging of the kidneys with venous blood when the patient assumes the erect posture, and the consequent increased weight of the organ, may in time tell upon the normal supports and induce a certain progressive degree of motility. Movable kidney was also reported by Bourcy,[19] in the case of a youth, aged nineteen years, and by Nivière,[20] in a young man, aged twenty years.

Pathology. Inasmuch as not a single case of orthostatic albuminuria has ever to come to post-mortem examination, there is no knowledge whatever as to either presence or absence of renal changes. There are theories of pathogenesis, to be sure, which are more or less plausible, and there is a fairly widespread idea that orthostatic albuminuria is functional or physiological. Of exact information, there is none. Senator[18] has long been of the opinion that albuminuria of the intermittent type may be physiological. According to him, physiological albuminuria exists, though limited to very small amounts of albumin, in healthy individuals of not very advanced age, in whose urine there is no evidence of any departure from the normal and in whose cases the albuminuria is called forth only by certain physiological causes, chief of which are overexertion, overeating (especially of proteids), cold baths, emotional disturbances, and mental overwork. Such cases of albuminuria must, however, be operative only in a transitory and desultory way, and cannot account for the continuous cases of orthostatic albuminuria so frequently observed. Others, and the majority of writers, are decidedly opposed to Senator's view, and, personally, I belong to the majority.

Edel,[13] observing that the amount of albumin diminishes after dinner, being less from three to six in the afternoon than in the forenoon, a fact exactly opposed to the idea that food increases the amount of albumin, sought a new explanation, which he endeavored to prove. He made the experiment of postponing the dinner hour, and discovered that he also postponed the time of minimum albuminuria in every case examined. He then abolished the dinner altogether and entirely eliminated the period of minimum albuminuria. He found, further, that, as is generally known, the ingestion of food causes increased diuresis. The recumbent posture is also associated with diuresis. He therefore arrived at the conclusion that the true theory of origin of the albumin is that it results from diminished diuresis, and hence proposes as a cure the ingestion of larger amounts of water and various diuretics. Ewald does not agree with Edel, and the latter's hypothesis has failed to attract much attention or any following.

The most plausible theory of pathogenesis is that of Marie and numerous other writers. As is suggested in my classification, it was early noted that cases of orthostatic albuminuria in young adults and even in older individuals were, as a rule, associated with hysteria, neurasthenia, and dyspepsia nervosa. In all of these individuals there was considerable vasomotor paresis indicated by the cold and semicyanotic extremities and by the beating abdominal aorta. Marie, while necessarily indefinite, subscribes to a theory of vasomotor origin. Ewald,[6] writing in Eulenburg's *Jahrbuch* upon renal diseases in the volume recently issued in January, 1904, puts the matter in this way: "When we consider all the facts that we have knowledge of concerning the genesis and causes of this peculiar affection, we are able to assert with certainty only this much: that disturbances of the circulation must be the underlying factors, manifesting themselves through the influences of certain reflexes in the renal parenchyma." The exact area is thought by Ewald to be in the glomeruli, though he admits the possibility that the tubules may also be within the area of vasomotor disturbance. As to the cause of the diurnal variations in the circulation, neither Ewald nor any other authority has been able to afford any information.

Symptomatology. *The Urine.* The quantity of urine passed in the twenty-four hours is approximately normal, averaging 1100 c.c. or 1200 c.c. in the young to 1500 c.c. or 1600 c.c. in adults. The specific gravity is not at all lowered; indeed, in a case reported by Beck,[14] the average specific gravity of 36 specimens, passed over a period of six months, was 1026.2.

The albumin found is serum albumin or globulin, best detected by the acetic acid and ferrocyanide of potassium test. Nucleoalbumin, according to Ewald, may be present, but it is very rare, The albumin is present, as a rule, in relatively small quantities, such as small or large traces, but it may be present in large amounts, even

⅛ of 1 per cent. The daily variation is fairly regular, there being no albumin in urine passed on rising, a maximum amount in that passed during the forenoon, usually about 11.30 A.M.; while in the afternoon the amount of albumin falls, reaching a minimum in the evening. In appearance the urine is perfectly normal, being lighter in color and increased in amount in the afternoon.

Microscopically, casts are rarely found. In Pavy's original paper the absence of casts was one of the diagnostic points. Personally, I was able to find casts in but 1 of my 5 cases, and I suspect that eventually cardiovascular signs of nephritis may develop in him. Ewald agrees that in the majority of true cases there are no casts. Huger,[13] reporting 2 cases of young men, both under twenty-one years, found casts in the urine of each. He expresses himself as feeling certain that very careful examination will show casts in all cases of orthostatic albuminuria.

Cryoscopy affords no information in regard to the presence of nephritis, the reduction of the freezing-point being within the normal variation. The methylene-blue test made by Hertz and Salomon also resulted negatively, indicating the probable absence of renal disease.

SUBJECTIVE SYMPTOMS. As a rule, there are no subjective symptoms in these cases, most individuals regarding themselves as healthy, still the patient may be languid, though not sick, and, according to Marie, may suffer from neuralgias of various sorts, palpitation, vertigo, and even nose-bleed. He is more apt to suffer, however, from hysteria, neurasthenia, or dyspepsia nervosa. The vasomotor disturbances are the most pronounced, cold hands and feet being the rule, and pulsatory abdominal aortas being very common. The arterial pressure is reduced in all true cases of orthostatic albuminuria. If it is found increased, the case is very likely a true nephritis, originating insidiously.

The vasomotor paresis doubtless explains the acceleration of the pulse, the variations of rate in Kuttner's 62 cases being as follows:

Rate	60	to	70	2	cases.
"	70	"	80	14	"
"	80	"	90	25	"
"	90	"	100	12	"
"	100	"	110	9	"

Thus, 46 had a pulse rate of 80 or more. Many of these cases of Kuttner were anæmic and chlorotic, and the increase in pulse rate may thus also find an explanation. In all 5 of my own cases there was an increased pulse rate.

Le Noir noted in his 24 cases that the individuals were, as a rule, thin, the deficient nutrition possibly being due to the dyspepsia and constipation which he frequently found.

Cardiovascular signs are invariably absent, there being no hypertrophy of the left ventricle, accentuation of the second aortic sound,

increase in arterial tension, as shown by the pulse and tonometer, ocular symptoms, œdema, or polyuria.

Diagnosis. The diagnosis is not difficult. Given a case of albuminuria, an examination of the urine passed by the patient on rising should be made. If this is found free from albumin, a series of samples should be collected during the next twenty-four hours and analyses made of each of them. If by this means the case shows an orthostatic albuminuria, other alterations in the urine should be sought, such as polyuria, marked oliguria, marked reduction of urea, lowered specific gravity, microscopic signs of renal diseases, such as various casts, renal epithelial cells, erythrocytes and leukocytes. These being negative, and by the previously made physical examination, the heart and bloodvessels being found free from signs of nephritis, the eyes free from hemorrhagic or albuminuric retinitis, the skin from œdema, and the nervous system from signs of renal involvement, the diagnosis of orthostatic albuminuria may provisionally be safely made. The case should then be kept under observation for many months, and repeated tests for albumin be made, so that the case may be accurately classified, either in the great group of insidiously beginning nephritis or in the group of symptomatic orthostatic albuminuria, or in the lesser group of true orthostatic albuminuria. When placed in the latter category, it must then be determined whether the case belongs to the intermittent or to the continuous type.

Prognosis. It seems very clear to all who have written on the subject that many cases of orthostatic albuminuria wholly recover. Thus, in Kuttner's 62 cases, 34 recovered within a year, 26 being followed from two to ten years. It seems equally clear that many of those not recovering do not subsequently develop into cases of nephritis. Thus Le Noir reports a case of a girl, age[1] eighteen years, followed until the age of thirty-two, at which time the case was reported; this girl married and went through three pregnancies without accident. She showed albumin daily, yet always remained in excellent health. Another case reported was that of a young girl, followed since she was seventeen years of age, who went through five pregnancies without mishap. Ewald is equally sure that there is no indication that the typical and undoubted cases lead to nephritis. Indeed, most cases do quite the reverse; they recover. Klemperer also states that these cases never run into Bright's disease. Teissier, of Lyons, who reported 28 cases in 1896, reported only 4 cases which subsequently developed Bright's disease; the other 24 recovered or else continued to pass albumin during the daytime without signs of nephritis developing. Lambert,[21] writing on the prognosis of albuminuria, states that the albuminuria of adolescence (seventeen to thirty years) is of good prognosis, expressing the opinion that few men pass six months of their life without casts or albumin of transient duration. Méry and Touchard report the

case of a girl with orthostatic albuminuria who married and went through a pregnancy without accident. Huger, on the other hand, finding casts in the 2 cases he reported, and believing that casts can be found with very careful search in all cases, believes them all to be latent Bright's disease. Achard[9] sensibly remarks that "in presence of a case of orthostatic albuminuria we cannot, especially before we have followed the patient for some years, formulate an unreserved prognosis."

Personally I am of the opinion that these cases showing the intermittent type of physical signs found in non-neurasthenic adults, with possibly a slight lowering of the specific gravity, even without the presence of casts, much more in their presence, should be regarded as cases of true organic renal disease. Those cases of continuous orthostatic albuminuria occurring in adults who are neurasthenic or hysteric, with unimpaired specific gravity and negative microscopic findings, should be regarded as functional in origin, with a relatively good prognosis. Those cases occurring in children, associated with movable kidney or with no apparent cause whatever, especially familial cases, should be regarded as functional, with good prognosis. Those cases occurring in children and associated with infectious diseases, as diphtheria, scarlet fever, variola, pertussis, and even typhoid fever, should be regarded as cases of true nephritis, very likely glomerular; and though they may recover, still, the prognosis should be reserved.

The amount of albumin is of no prognostic value whatever; small amounts may mean nephritis, large amounts may mean functional derangement. Of more importance from the prognostic standpoint is the manner of life of the patient: his business cares and worries, his food and the manner and regularity of getting it, the amount of alcohol he consumes, his habits with regard to tobacco, the amount of sleep he gets, etc.

I believe that with time and the multiplication of reported cases we shall come to look upon orthostatic albuminuria, first, as a symptom of beginning nephritis; second, as a functional derangement associated with vasomotor disturbance, especially in hysteria and neurasthenia, and neuropathic individuals in general; third, as a circulatory derangement in congenital floating kidney; fourth, as an hereditary, familial defect; fifth, as a delicate sign of postinfectious nephritis. Thus, there will be no disease of orthostatic albuminuria, *per se*, any more than there are at the present time diseases known as oxaluria, phosphaturia, or indicanuria.

Bibliography.

1. Pavy. Lancet, 1885, p. 706; 1886, p. 437.
2. Moxon. Guy's Hospital Reports, 1878.
3. T. M. Rooke. British Medical Journal, 1878, p. 596.
4. Dukes Clement. Ibid., November 12, 1881.
5. S. Schön. Jahrb. f. Kinderkr., 1895, Bd. xli. p. 307.

6. Ewald. Encylopädische Jahrbücher der gesam. Heilkunde, Eulenburg; article, Nierenkrankheiten Neue Folge 11, pp. 433–442.
7. L. Kuttner. Zeitsch. f. klin Med., 1902, Heft 1 and 2.
8. Sutherland. THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, August, 1903, p. 289.
9. Achard. Bull. et mém. de la Soc. méd. des hôp., June 22, 1900, p. 757; and June 14, 1901, p. 640.
10. Méry and Touchard. Ibid., 1901, pp. 629–640.
11. B. J. Stokvis. Wiener med. Wochensch., 1902, pp. 850 and 910.
12. Paul Edel. Münch. med. Wochenschr, 1901, pp. 1833 and 1884.
13. Wm. E. Huger. Johns Hopkins Hospital Bulletin, 1902, p. 75.
14. H. G. Beck. THE AMERICAN JOURNAL OF THE MEDICAL SCIENCES, 1903, p. 466.
15. Le Noir. Bull. et mém. de la Soc. méd. des hôp., 1901.
16. Senator. Nothnagel's specielle Pathologie.
17. Hertz and Salomon. Bull. et mém. de la Soc. méd. des hôp., 1901.
18. Lenoissier et Lemoine. Comptes-rendus de la Soc. de biol., 1903, pp. 466, 469, 605.
19. Bourcy. Bull. et mém. de la Soc. des hôp., 1900, Nr. 21.
20. Nivière. Ibid., 1901, p. 148.
21. Lambert. Medical News, 1903, p. 636.

ADIPOSIS DOLOROSA.

WITH REPORT OF THREE CASES.[1]

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AND

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THE three cases described below are examples of Dercum's disease, or adiposis dolorosa. Two of them are of the nodular form and one is of the localized diffuse form. All but one had the four cardinal features noted by Vitaud—viz., fatty tumor or tumors; pain, both spontaneous and induced in these cases; asthenia, and psychic symptoms. In Case I. the latter feature was wanting.

No disease of the thyroid gland was noted in any of these cases. Two of them used alcohol. Syphilis was not proven in any case. In one improvement took place under thyroid treatment. All were in women, as most reported cases have been. In none was hemorrhage from the mucous membranes present. Twenty-eight cases of this disease have been recorded according to Dercum and McCarthy. It must be more frequent than this number of cases would indicate, and will almost certainly be more often recognized when its characteristics become more widely known.

Of these three cases Dr. Hall saw one of the nodular variety in his private practice in September, 1902, and shortly afterward had the privilege of studying with Dr. Walbrach Case III. in the latter's service at the Denver City and County Hospital, after the diagnosis had been made by Dr. Walbrach. Case II. was examined by Drs. Fleming and Freeman, to whom the entire credit of the diagnosis

[1] Presented to the Denver City and County Society, March 1, 1904.

belongs. Dr. Hall testified as an expert regarding this case, but had no opportunity for personal examination. This is the first appearance of the disease in court to our knowledge.

CASE I. (Described by Dr. Hall.)—Mrs. A., aged thirty-eight years, American, referred to me by Dr. Leonard Freeman because of stomach symptoms. She had a history of rheumatism at fourteen. One child was born twenty years ago; two miscarriages, at four and six months, since. No history nor appearance of syphilis. Complains of tiring easily.

She had symptoms of gastric hyperacidity, with much epigastric pain. The amount of HCl was estimated by Dr. H. R. McGraw to be 0.0198, the total acidity 75.

Physical examination negative as to internal organs. Reflexes normal. Urine negative. She was decidedly neurasthenic and complained greatly of pain over the right shoulder. Upon examination I found a fatty tumor one and one-half inches in diameter and one-third as high over the right deltoid muscle. It was very tender to the touch, and gave rise to much spontaneous pain. A somewhat larger tumor was present on the lower posterior surface of each thigh, equally tender, but with less spontaneous pain. Two smaller and similar tumors existed upon the trunk, but they were only slightly tender when compared with the others.

She had pads of fat over the clavicles, but without pain or tenderness. There were no signs of myxœdema.

She seemed ordinarily acute mentally, with good memory. She had used "headache tablets" freely for the pain, and probably alcohol as well.

I saw her but three times, the gastric symptoms yielding quickly to treatment. Acetanilid relieved the pain of the fatty tumors considerably, and she continued to use it until she removed to another town. I have not since heard from her.

This patient presented the fatty tumors, with tenderness and spontaneous pain and asthenia, but was without any marked psychic symptoms. The case should be classed in the nodular variety.

CASE II.—Dr. Hall appeared in the District Court May 13, 1903, with Dr. Fleming; and, at his request, as an expert witness in this case. Drs. Fleming and Freeman have kindly given us permission to publish the following history, and to them is due the entire credit of the diagnosis and of this report:

"Mrs. C., aged twenty-five years, was bruised upon the right hip on October 1, 1901, by being knocked down upon the stone pavement by the pole of a hack. Two months later she was well so far as the bruises were concerned, the usual appearance of a contusion having entirely cleared up. In November, 1902, thirteen months after the injury, she was examined by Drs. Fleming and Freeman, and by other surgeons for the prosecution, because of a

suit brought against the owner of the team on account of the alleged damage to the right hip-joint.

"At this time she was fleshy, and the thighs were especially so. She had, over the right trochanter, a circular fatty tumor of the size of the palm and nearly an inch in thickness, very sensitive to pressure, and giving rise to much spontaneous pain as well. It was alleged to have appeared since time of the injury, and this allegation was apparently true. It was blackish in the centre, reddish and mottled toward the edges, with large veins upon the surface, and showing the lobulated appearance of fat. There was no heat nor other sign of acute inflammation.

"The extreme sensitiveness of the tumor was not noted in the surrounding area, although this part was hyperæsthetic. Pressure upon the heel caused a paroxysm of pain shooting upward to the tumor. The testimony showed that this condition had existed for months, confining her to bed most of the time.

"Under chloroform there was found to be no disease of the hip-joint, according to the report of the surgeons, but the leg was nearly one-half inch shorter than the left, and slightly atrophied, apparently from disuse because of pain. She was exceedingly pale and feeble, irritable, and duller mentally than formerly."

This was apparently a case of the nodular ecchymotic form of adiposis dolorosa. The shortening of the leg was not proven to be associated with the injury. It is interesting to note the presence of tumor about a year after the disappearance of the bruises, for there seems to be no evidence that the adiposis was present at the first examination by her physicians.

Hutchison and Allbutt mention the possible association of the disease with traumatism. Doubtless her limp was in part due to the pain upon movement of the affected limb, wholly apart from any possible bony change. She has certainly suffered greatly from the pain of the tumor.

Drs. Fleming and Hall testified that this trouble was apparently not one of surgical injury, but of the nodular variety of adiposis dolorosa, the black-and-blue appearance being recognized as of occasional occurrence in this disease. Bochroch and Dercum and McCarthy speak of the ease with which ecchymoses occur in painful adiposis, although we have not noted a record of the occurrence of discoloration upon a single nodular tumor. Much credit is due the reporters for their recognition of so unusual a form of the disease. The jury promptly rendered a verdict in favor of the defendant liveryman, there being no sufficient evidence that the trouble was the result of the alleged injury. No further history of this case could be obtained.

We find here the single fatty tumor, the tenderness and spontaneous pain, the asthenia, and the development of the mental dulness and irritability.

CASE III. (Reported by Dr. Walbrach.)—The following case of adiposis dolorosa came under my observation at the County Hospital November 10, 1902, and is sufficiently characteristic to merit attention. It was shown by Dr. Hall at his clinic at the Denver City and County Hospital, at a time when the "irritability and causeless quarrelling" reached almost to the border of actual insanity.

The case is that of Mrs. Ella N., aged forty-five years, married, housekeeper, American by birth, both parents dead, mother of old age, father of unknown cause. Patient had scarlet fever when a child. In later years pneumonia, rheumatism, and typhoid. Denies specific infection. No history of tuberculosis in the family.

Patient claims that the present trouble began four weeks ago with a swelling in the lower extremities, accompanied with intense pain in these regions, apparently of a neuralgic character. Owing to the mental condition of the patient it is impossible to obtain a clear, concise history in regard to the onset and further development of symptoms. She admits having used alcohol freely. On inspection we find both hips and both thighs and the regions around and below the knees to be enormously enlarged, giving the patient the appearance of excessive obesity in these parts. Close examination reveals that the enlargements consist of adipose tissue, which is very unevenly distributed.

Below the left knee it is very irregular and lumpy. The abdominal wall also contains a large amount of fatty tissue.

The patient has no unusual deposit of fat about the shoulders or arms. This disorder of nutrition, whatever the cause may be, was limited in this case to the lower extremities. The second prominent symptom is the extreme tenderness over the deposits of adipose tissue. Every slightest touch almost anywhere below the waist is attended with cries of pain. The patient also suffers from crises of pain, arising spontaneously without any external cause.

The third most prominent feature in the case consists of the psychic phenomena.

These consist of extreme irritability, and, to borrow an expression from Dercum, "a marked tendency to causeless quarrelling and even vague ideas of persecution." She was continuously quarrelling and fussing with the physicians and nurses, claiming that she was being neglected and maltreated.

A fourth symptom of great prominence was the marked asthenia. The patient, although apparently well nourished, was confined to her bed. Even sitting for a few minutes in a chair seemed to completely exhaust her. The grip of both hands was extremely weak.

Examination of the heart and lungs was negative. Slight atheromatous changes were noted in the radial arteries. Liver dulness seemed moderately diminished. A pelvic examination revealed nothing abnormal. Urine contained a moderate amount of pus, no

albumin or casts. Patient lost control of bladder at times. The right eye deviates outward since childhood. Reaction of pupils to light and accommodation was normal. Knee-jerks present, not exaggerated. No anæsthesia was found in any part of the body. No abnormality of the thyroid gland could be detected by physical examination.

The above-described accumulation of adipose tissue—pain, asthenia, and psychic phenomena—are regarded by Vitaut as the four cardinal symptoms of the disease, and this meets with the approval of Dercum. Having these four cardinal symptoms present in this case, we are justified in making the diagnosis of adiposis dolorosa. If we accept Vitaut's division of adiposis dolorosa into, first, the nodular; second, the localized diffused; and, third, the generalized diffused forms, we find that the case under discussion belongs to the second group, namely, the localized diffused form.

The patient was put on thyroid extract and iodide of potassium, this treatment being continued for about two months. At the end of this time she had improved to such an extent that she was able to be up and about, and left the hospital after having been confined to bed three months. When seen a year afterward the patient had apparently continued to improve without further treatment. She related that she had been able to do her usual household duties during that time and had been free from pain.

At the present time but five cases of adiposis dolorosa have come to autopsy, four of which are recorded by Dercum and one by Burr. In two of these the thyroid gland was enlarged and the seat of calcareous infiltration. Two others showed partial atrophy of the same gland, while in the fifth the gland was found to be normal. Three out of the five reported presented changes of the pituitary body, namely, enlargement and gliomatous degeneration in two, and adenocarcinoma in the third. The last three were the only ones of the five examined microscopically. Besides the above-mentioned changes an interstitial neuritis was found in various nerves as they passed through the fatty tissue. In one of Dercum's cases sclerotic changes in the columns of Goll were found. However, the neuritis and the degenerative changes of the thyroid and pituitary body are held by Dercum to be the most important pathological findings.

In comparing the pathology of adiposis dolorosa with that of acromegaly, one is confronted with the striking similarity of the lesions. In thirty-four autopsies of acromegaly recorded by Furnival, and mentioned by Osler, changes in the pituitary body were found in all, and in the majority either hypertrophy or neoplasm. In twenty-four cases in which it was examined the thyroid gland was normal in but five. The fact that both affections represent abnormal processes of growth, the one characterized by an increase of fatty tissue, the other chiefly of osseous tissue, and also that the

majority of the cases of each, so far reported, have occurred in females, is suggestive of the possibility of the two diseases having at least in part the same etiological factors.

Until we obtain a more exact knowledge of the function of the thyroid gland and the pituitary body in relation to growth and nutrition of the body, this question will probably remain undecided.

ANEURYSM OF THE HEART.

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As far as I have been able to determine, but two examples of this interesting condition have been contributed to general literature by American writers during the last thirteen years, namely, the cases of Sailer[1] and Sangree.[2] Hare[3] reported a case of "Suspected Cardiac Aneurysm," but I do not know that the case ever came to autopsy.

Foreign writers reported during the same period a number of cases of the various kinds of cardiac aneurysms, to 34 of which I have reference by title. Of these, 23 are entitled "Aneurysm of the Heart," or do not refer, by title, to the precise location of the lesion. One specifies the interventricular septum; 1, aneurysmal communication between left ventricle and right auricle; 1, the internal mitral flap; 2, the apex; 2, the auricles, and 4, the left ventricle. Both American cases were of the left ventricle.

Not having access to the full reports of most of these cases, I am unable to analyze them as fully as I should like to. It may be assumed, however, that the left ventricle was affected in a large majority of those not definitely defined, and, in most instances, at or near the apex. Of 147 cases collected from the literature, 144 have this situation.

It must be remembered, in reading the ancient history of cardiac aneurysm, that no distinction was made between hypertrophy and dilatation and true aneurysm. The first differentiation was made by introducing the terms "active and passive" (Corvisart).

As late as thirty years ago, however, some writers discussed aneurysm and other forms of enlargement together, and without making any definite distinctions.

The case herewith reported occurred in the practice of Dr. A. A.

[1] Heart with Two Ventricular Aneurysms, Proceedings of the Pathological Society of Philadelphia, 1897.

[2] A Case of Aneurysm of the Left Ventricle, Journal of American Medical Association, 1898.

[3] A Case of Suspected Cardiac Aneurysm, Medical News, 1897.

Davis, of Calumet, Michigan, who kindly furnished me the clinical history, and at whose invitation I conducted the autopsy.

The patient, Mr. W., aged seventy-two years, had severe angina pectoris in 1894. How many attacks not stated. No previous history obtained.

In September, 1899, he had a left-sided dry pleurisy. The anterior part of the pleura was especially involved. There was much pain about the apex of the heart and little or none elsewhere. Mild fever was noted, which persisted for four or five days, after which the temperature fell to normal and the pleuritic pain gradually subsided. The patient was left in a weak and depressed state. The pulse, which, according to the patient's statement, had been more or less intermittent for some years, skipped, on an average, only once in fifteen beats at this time. The pulse rate was 75. The right radial pulse was much smaller than the left. Relative heart dulness was considerably increased, but absolute dulness was only slightly increased downward. Situation of apex beat not stated.

After about ten days periods of dyspnœa set in, attributed by the patient to flatulence. In spite of a strong though occasionally intermittent pulse, dyspnœa gradually became more severe. There was no cardiac murmur at this time. Early in December a distinct systolic murmur was first heard at the apex.

Toward the middle of December dyspnœa subsided, the murmur was no longer heard, and the appetite and strength increased considerably. After two weeks of comparative comfort dyspnœa and the murmur reappeared and the legs became œdematous. There was also œdema of the right hand and forearm, but not of the left. Dyspnœa gradually became urgent; the patient developed a short cough, expectorated a good deal of tenacious, blood-streaked mucus, and finally died on February 5, 1900, with the usual symptoms of incompensation.

The urine was negative throughout. The angina recurred once or twice at the outset of the last illness.

Post-mortem examination was made about six hours after death. The findings were as follows:

Body of medium size; muscles flabby; emaciation marked; skin sallow and dry. There is moderate hypostasis of dependent parts; marked œdema of both legs, extending well up into the thighs; moderate œdema of right hand and forearm; no œdema of left hand or forearm. Abdomen moderately distended; rigor mortis present. The head was not opened, and the spinal cord not examined.

Thorax. There are numerous adhesions between the sternum and the left parietal pleura. The pericardium and pleura are adherent, the adhesion involving a large part of the surface of the pericardium, which is distended with fluid. On opening the pericardium 200 c.c. of blood-stained fluid were removed. The pericardium is smooth and somewhat thickened; no adhesions between layers

except over lower third of left ventricle, where they are firmly adherent over an area having a diameter of two and a half inches. The heart is much enlarged; it is about twice as large as the fist; apex in sixth intercostal space half an inch inside nipple line. The left ventricle lies anteriorly, occupying the position normally held by the right ventricle. The whole heart has undergone partial forward rotation on its long axis. At the site of the adhesion between the pleura and the pericardial layers the wall of the left ventricle bulges, forming a pouch as large as a small orange. The heart with the attached pericardium was removed. It was full of dark-red fluid blood.

The Coronary Arteries. The coronary arteries are stiff and tortuous. The left coronary contains, in the auriculoventricular groove, a number of extensive areas of calcification which greatly narrow its lumen. In the anterior descending branch of the left coronary there is marked endarteritis with calcareous deposits, and nearly complete stenosis at a point one inch below the interventricular groove. The lumen of the artery narrows progressively until at the edge of the aneurysmal pouch there is practically complete stenosis. The intima and media can be easily stripped off, as a separate tube, the whole length of the vessel. The large trunk of the descending branch leading to the apex is markedly sclerosed throughout its entire length, and is completely stenosed midway in its course. There is nearly complete stenosis in the posterior interventricular branch of the right coronary. Beyond the stenosis the lumen can be traced only with great difficulty. The intima and media strip off as stiff tubes the whole length of the artery.

Section of the Heart. The wall of the left ventricle is from 12 to 14 mm. thick except in the aneurysm, where it is only from 2 to 3 mm. The muscle is pale, light brown, soft, and flabby. There is marked increase of subpericardial fat. Muscle is entirely lacking in the wall of the aneurysm, which consists of tough, fibrous tissue. The aneurysm contains a mixed clot, adherent to its wall, and merging into a red clot as the lumen of the ventricle is approached. Thorough organization has taken place in the periphery of the mixed clot, and has firmly blended it with the wall of the aneurysm. There are no clots elsewhere in the ventricle, and the endocardium is pale and smooth. The edges of the mitral segments are somewhat nodular, and there is slight curling. The orifice admits four fingers. The columnæ carneæ are flabby and flat. The right ventricle is small, its endocardium is pale and smooth, it contains blood, and its tip reaches only to within 4 cm. of the apex. The tricuspid segments are normal; the orifice admits three fingers.

The Auricles. Both auricles are dilated and thin walled, and contain fluid blood.

The Left Lung. The pleural surfaces are almost completely adherent. There is also extensive adhesion between the parietal

pleura and pericardium, involving a large part of the latter. The lung is very œdematous, but crepitates throughout. It is otherwise negative.

The Right Lung. The right pleural cavity contains several litres of blood-stained fluid. Excepting marked œdema, the lung is negative.

The Liver. The liver shows fatty degeneration and œdema, otherwise it is negative.

The Spleen. The spleen is œdematous, dark purple, and has two white, thickened patches, about one-third inch in diameter, on its anterior surface.

The Kidneys. Except for œdema the kidneys are negative on macroscopic examination.

The intestines are negative.

The Arterial and Venous Systems. The aorta contains a few yellowish, subintimal patches below the arch. The lumen is large and the walls somewhat stiffened. The aortic and pulmonary semilunars are negative. The arterial system shows, in general, only a mild grade of sclerosis. No microscopic examination was possible owing to the tissue being accidentally destroyed while in preparation.

Diagnosis. Chronic adhesive pleurisy of left pleura; chronic adhesive pericarditis; chronic fibrous myocarditis; advanced end-arteritis of coronary arteries, causing nearly complete stenosis at various points; aneurysm of left ventricle; relative insufficiency of mitral valve; moderate fatty degeneration of the liver; hydrothorax; hydropericardium; œdema of the lungs, spleen, liver, and kidneys.

In general this case presents the features common to most cardiac aneurysms. Their situation in the left ventricle, near the apex, is the rule. As to the causes leading up to the aneurysm, the obliterated, or nearly obliterated, coronary arteries and consequent anæmia, degeneration and replacement by fibrous tissue of the heart muscle, and the adhesions between visceral and parietal pericardium and pleura at the site of the infarct, with resultant traction upon the weakened heart wall, show very clearly its origin and development.

A very remarkable feature, however, is the rotation of the heart on its long axis, which threw the left ventricle forward nearly into the position of the right ventricle. I am positive that this was not the result of manipulation in removing the sternum, as the latter was very carefully raised and its adhesions with the pleura cut and not torn. It was probably caused by gradual contraction of the extensive adhesions between the pericardial and pleural layers, the latter being in turn securely adherent to the sternum, which was a fixed point from which to exert traction. Also, the suction normally exerted upon the ventricle by the lung, may be supposed to have exerted a forward pull by means of the adhesions.

Of how long-standing was the aneurysm? The development is usually slow, though rapid growth is a recognized possibility. The endarteritis of the coronary vessels was probably a slowly progressive disease, and the degenerative changes in the heart muscle doubtless proceeded *pari passu* with it. Granting that aneurysms tend to fill themselves by clot formation and organization, it may be argued, from the thinness of the pouch, that the lesion was comparatively recent. Clot formation is, however, favored by stagnation, and hence would be most rapid in an aneurysm with a constricted orifice, which was not true of this case. All things considered, one is justified, I think, in selecting the attacks of angina pectoris in 1894 and 1895 as the approximate starting point rather than the condition diagnosed as pleurisy in September, 1899.

In view of the extensive and extreme disease of the coronary arteries, the vessels of Thebesius must have been the principal contributors to the nutrition of the myocardium for some time before death.

The case adds nothing to the diagnosis of cardiac aneurysm, the symptoms having been throughout those of chronic fibrous myocarditis.

ŒSOPHAGEAL NEUROSES.

By A. L. Benedict, A.M., M.D.,
of Buffalo, N. Y.

Neuroses in general are classified under three heads: motion, secretion, and sensation. As the œsophagus has no true glands and no secretion aside from that of mucus, secretory neuroses are out of the question, unless we accept the possibility of a mucous neurosis analogous to that of the colon. Personally, I deny absolutely the neurotic etiology of a flow of mucus from the colon, believing that the advocates of this theory have put the cart before the horse, and that the neurotic condition is the result of the chronic colitis (often including a typhlitis or scolecitis) or of an antecedent splanchnoptosis, or other cause. However, if one admits a mucous neurosis of the colon, he can easily find the same thing in the œsophagus, and it is surprising that this opportunity for fame has been neglected.

Sensory neuroses, in general, are either neuralgic or are due to ordinary physiological conveyance of more or less painful sensations, or are the local expression of various organic nervous diseases, such as neuritis, tabes, and many others. There is no appreciable diminution of nervous sensibility below the nearly zero normal to internal organs, so that we cannot classify sensory neuroses as exalted and

depressed, as we can sensory and motor disorders. However, as a matter of convenience, we may recognize neuralgia, rheumatic and, theoretically, neuritic and tabetic pain in the œsophagus, as well as that due to organic lesion and the burning due to regurgitation of acrid gastric contents. It is absurd, however, to call such local pains neuroses. On the contrary, there would be a neurosis if such adequate causes of pain did not produce it. A more or less complete absence of œsophageal sensibility may occur in various paralyses and central nervous diseases.

We may therefore limit the discussion to motor neuroses. These may be classified as follows:

1. Depressed . . . . . { Paresis (sluggishness). / Paralysis.

2. Exalted . . . . . { Simple increase of peristalsis. / Spasm { Clonic { Direct. / Reversed. / Tonic.

Sluggishness, paralysis, and simple increase of peristalsis may be termed, after the analogy of gastric disorders, hypotony, atony, and hypertony, respectively. Or we may substitute -kinesis (with the accent on the second syllable, not rhyming with émesis) for -tony. Absolute atony or paralysis is exceedingly rare, if ever present, on account of the joint sympathetic and pneumogastric innervation of the œsophagus. Hypotony, or, as ordinarily termed, atony, is an exceedingly common condition. It may be determined by noting the delay of the œsophageal murmur after the rise of the thyroid cartilage, in drinking, and is usually associated with gastric hypotony and constipation due to intestinal hypotony. It is rather doubtful whether all these conditions should not be considered as essentially organic, on account of defective development of muscle, connective tissue and nerve fibre. At any rate, hypotony is liable to develop into dilatation, whether of œsophagus, stomach, or intestine.

Œsophageal hypertony is diagnosticated with some difficulty, or, rather, the modest clinician hesitates to adopt an arbitrary period for the passage of the bolus through the œsophagus and to use the term hypertony, if the period is accelerated by a few seconds. One must not carry the antithesis between hypotony and hypertony to the degree of assuming that œsophageal hypertony necessarily occurs in conjunction with rapid emptying of the stomach into the bowel, or through the œsophagus, or with diarrhœa. The first is more likely to be due to pyloric relaxation than to general gastric hypertony, and diarrhœa is very rarely a pure motor phenomenon, even after the ingestion of a drug.

Spasms of the œsophagus may, theoretically, be divided into those of circular, longitudinal, and both sets of muscle, but this classification is not warranted clinically. Clonic spasm, whether

direct or reversed, occurs mainly in connection with similar spasms elsewhere, especially of the stomach during vomiting. Again, a spasm typically occurring tonically may be interrupted so as to merge into a clonic spasm.

Tonic spasm, including an apparently clonic spasm due to interruption, may be stationary in one segment of the œsophagus, or may apparently travel up and down, or may change from one location to another, on the recurrence of the spasm. There is, of course, no possibility of relative movement of a fixed spasm, as in the case of spasm of a segment of intestine.

Tonic spasm of the œsophagus usually assumes one of two forms: either a dysphagia analogous to that of organic stricture, and presenting the same signs on sounding, except that the spasm may be "tired" by steady pressure, when it will gradually or suddenly relax; or the spasm may take the form of a moving globus (hystericus?). In the former case the patient complains merely of difficulty in swallowing, more or less intermittent and variously described in subjective or objective terms. It is almost never sufficient to interfere materially with nourishment, although it may occur in persons, especially young women, who are already badly nourished. There is not usually any confusion of description with that of globus. Indeed, usually the location is fixed quite definitely by the patient and is verified by sounding, and the position does not change from one time to another. Some authorities have made very definite statements regarding the location of the spasm, but my own experience allows only the statement that it is most frequent opposite the larynx, where there is a mechanical reason for spasm, and close to the cardia, where more or less of a sphincteric action is possible. At both of these levels, too, there is a fixed point of resistance. It has frequently occurred to me, as doubtless to others, to surmise that there may be an organic cause for a definitely fixed spasm, occurring in a non-hysterical individual. It is practically impossible to demonstrate, but it is plausible to assume a minute traumatism, as from a fish-bone, seed, or some similar cause.

Occasionally tonic but more frequently clonic spasm is due to some well-defined reflex cause, at a greater or less distance. The most frequent of these are regurgitation of acid chyme through the cardia; lodgement of a foreign body in a tonsillar crypt; inflammatory or other lesion of the dorsum of the tongue, fauces, epiglottis, etc.

Patient No. 54, of 1896–7, presented a rather obstinate but clearly spastic stricture of the œsophagus, several centimetres above the cardia. Some months after its relief, which was accomplished by sounding, he died of cancer at the cardia, which had been free from obstruction at the time of the spasmodic stricture.

Patient No. 43, of 1898–9, had considerable dysphagia and ischochymia, due to reflex from small tumors at the cardia and pylorus, respectively. The tumors were seen at operation and

were unable to produce mechanical obstruction at either site. The tumors were thought to be cancerous, but the patient recovered after the establishment of a jejunal fistula for a month, and she is still alive and was in excellent health when last seen.

I may digress for a moment to express the opinion that spasm of a muscular tube of the body usually indicates some real irritant, as a foreign body, calculus, painful lesion, as a small ulcer, or else that it is a reflex indication of genuine disease situated at a distance, but in the same tract. For instance, biliary spasm and jaundice may be due to scolecitis; appendicular or cæcal colic to gallstones in the biliary tract; intestinal spasm to scolecitis; gastric spasm to gallstones, intestinal worms, etc.

One of the most interesting hysterical spasms of the œsophagus that I have seen was in patient No. 67, of 1897–8, a young woman who had nursed her mother through a fatal case of cancer of the cardia. The girl simply duplicated her mother's symptoms, and there was a genuine resistance to the sound a little above the cardia. There were no other symptoms of hysteria.

Œsophageal spasm of the globus type presents many difficulties of explanation. I have seen it so seldom in ordinary hysterical cases (which do not often reach a specialist unless in nervous diseases), and so often in patients who were otherwise not in the least hysterical, that I hesitate to qualify it as globus hystericus. Is the globus purely a subjective sensation, or is there a real "lump in the throat," formed by muscular spasm and resembling that which forms at the base of a dog's penis during intercourse? When the patient describes the lump as rising or sinking gradually, is the motion purely subjective, or does the contracted area actually move? If stationary spasms are accurately located, is it not reasonable to suppose that the globus actually moves, as it seems to? Then, again, when a sober, middle-aged man of phlegmatic type describes a globus among his symptoms, why should we consider it any more hysterical than a gastric spasm causing ischochymia, or spastic constipation, or even biliary spasm?

As it had never been convenient for me to pass a sound during an attack of globus, I could not state whether a spasm was really present nor whether it really moved. Several of my friends, called by telephone, could not enlighten me. The text-books at hand did not afford any definite information. Dunglison mentions globus as a sensation. The late A. L. Loomis refers to it as the imagination of a lump rising from the epigastrium to the mouth. Frank Baker and G. L. Watson speak of it as a constriction of the muscles of the pharynx, the latter including the œsophagus. Ewald and Hemmeter omit all reference to it except as a name. G. R. Butler and James Tyson speak of it as a sensation. H. R. Hopkins informs me of his personal belief that the condition has never been scientifically studied.

One form of globus, which is quite different from an hysterical manifestation in the ordinary sense, occurs after prolonged sobbing, laughing, violent hawking to remove mucus, or even after deglutition of dry foods. This is especially likely to come on if the attempt is made to stop laughing or sobbing suddenly by swallowing or by forced inhibition. Even one or two attempts at swallowing may bring it on if the throat is already dry from dust, smoke, etc. This form of globus is almost or quite confined to the pharynx and may be succeeded by a distinct lameness.

The following table, originally published in the *Medical Fortnightly*, affords a general conspectus of the various reflexes in which the pharynx and œsophagus may be concerned more or less directly. It is unnecessary to enter into details.

Reflexes Mainly Due to the Pneumogastric Nerves.

The pneumogastrics are concerned in a number of reflex phenomena, whose function is especially to protect the respiratory and alimentary passages from injury. Such protective acts are, obviously, expulsive and depend mainly on the action of the diaphragm, whether to empty the respiratory or alimentary passages. It is convenient to consider with these protective, expulsive (and, therefore, expiratory) reflexes certain others that are mainly inspiratory. The normal ingestive processes of respiration and deglutition have already been considered.

	Expiratory reflexes.	Inspiratory reflexes.	
Primary protective	Vomiting	Swallowing	Respiratory.
Aborti ve vomiting	Retching		
	Gagging		
	Puking	Air-swallowing	
Abnormal, but of frequent occcurrence	Belching		
	Water-brash		
	Rumination		
Laryngeal construction	Cough	Hiccough	Alimentary.
Nasal obstruction	Sneeze	Sniff	
Audible vibration of oropharyngeal cavity	Laugh	Sob	
Crying is laugh or sob plus lacrymation.			
Laryngeal obstruction prolonged	Strain		
Prolonged inspiration with general flexor spasm	.....	Yawn	

Both inspiratory and expiratory—(single) sigh; (repeated) panting.

The various conditions included under the term aerophagia deserve our consideration. Generally speaking, aerophagia, or, rather, the subsequent expulsion of air, is construed as the formation of gas by fermentation in the stomach. Some have even gone so far as to consider it as gastric respiration, with elimination of CO_2, as in the case of the lungs. One look at a section of gastric mucosa is sufficient evidence that no appreciable quantity of gas can be formed

in this way. I have also described, in *International Clinics*, a rare method of production of CO_2 without marked fermentation, due to the union of acid gastric contents and alkaline carbonates in the upper intestine, with relaxed pylorus, so as to allow expulsion upward.

Air-swallowing is an inevitable accompaniment of ordinary deglutition and is increased by rapid eating and by certain formations of the throat not well understood. Thus there is very frequently a moderate belching of air during or shortly after a meal.

Aerophagia, as a neurosis, means almost any gradation between air-swallowing in the literal sense and a hiccough. At the former extreme the patient simply has a trick of swallowing air and belching it up; at the latter, the œsophagus is relaxed and at the sudden stoppage of the entrance of air into the larynx, by the closure of the glottis, the chest, still expanding, draws a little air into the œsophagus. In typical aerophagia there is little to justify the derivation of the word, but the condition is an hysterically magnified hiccough.

Patients No. 47, of 1902–3, and No. 64, of the same year, illustrated this condition, the latter in an exaggerated degree. The former was really a sensible, middle-aged woman, who readily co-operated in treatment, which is necessarily partly an exercise of will power. The latter patient was an extremely neurotic woman aged thirty years. She had suffered with "belching of gas" for years and would have an attack whenever excited by any cause, even the arrival of visitors. She often had attacks on the street, and rarely failed to have one when she came to my office. Sometimes they would continue for an hour or more, but at the office they were always speedily terminated by some form of instrumentation. While it was not feasible to measure the air, it was shown, by collecting it in mouthfuls, to amount to at least 100 c.c., and by blocking the mouth and nose it was clearly shown to be drawn in immediately before it was belched out. This observation was also confirmed by auscultation. It is rather questionable whether the air enters the stomach in these cases or not. Probably there is an individual variation as well as a temporary one. This neurosis is disgustingly noisy and causes much embarrassment to the patient and her family. In this particular case the patient's nose was obstructed by a mass of polyps, and it was thought that this might have had a bearing on the etiology. Its removal has not, however, produced any relief of the neurosis after a year. It is, of course, useless to treat such patients with antiseptics, unless an indication also exists in the stomach and bowels. Nerve sedatives are of some value, but the principal reliance is to be placed on instrumentation to break up spasm (as, indeed, in most forms of œsophageal neurosis), and on obtaining the patient's intelligent co-operation.

REVIEWS.

PROGRESSIVE MEDICINE. A QUARTERLY DIGEST OF ADVANCES, DISCOVERIES, AND IMPROVEMENTS IN THE MEDICAL AND SURGICAL SCIENCES. Edited by HOBART AMORY HARE, M.D.; assisted by H. R. M. LANDIS, M. D. Vol. I., 1904. Surgery of the Head, Neck, and Thorax; Infectious Diseases, Including Acute Rheumatism, Croupous Pneumonia, and Influenza; Diseases of Children; Laryngology and Rhinology; Otology. Philadelphia and New York: Lea Brothers & Co., 1904.

THE March issue of this important periodical contains some of the most important sections which appear in the course of the year. The first is that by Dr. Charles H. Frazier on Surgery of the Head, Neck, and Thorax. This large field is most successfully covered, and all the real advances in diagnosis and treatment commented upon.

The section on Infectious Diseases, which includes Rheumatism, Pneumonia, and Influenza, is by Dr. Robert B. Preble. Its value is greatly enhanced by the manner in which the editor has winnowed the wheat from the straw, and extracted from the vast mass of recent literature upon these subjects all which may be accounted of real value.

Dr. Floyd M. Crandall contributes a most interesting section on the Diseases of Children, and the concluding sections, that of Laryngology and Rhinology, by Dr. Charles P. Grayson, and that by Dr. Robert L. Randolph, on Otology, cover their several specialties in a most thorough and interesting manner.

Progressive Medicine has always occupied a very different and much higher plane than all publications attempted in a similar manner. It is not a mere compilation of abstracts from the current literature, but a thorough presentation of the views of its editorial staff, which is composed of men of recognized standing in the medical profession, upon the progress of medicine and surgery, and of the various specialties. To the general practitioner or specialist it possesses great value as a progressive text-book of all the various branches of medical science.

With this volume *Progressive Medicine* appears in a new dress, which will undoubtedly commend itself to its readers. It has long been a matter of wonder with men of the medical profession in this

country that American book publishers do not issue at least some of their works in the strong paper bindings which are so commonly used in France and Germany. Such a form of publication cheapens the cost of the work, makes it much more light and convenient to hold, and permits of binding up in styles to suit the individual taste. The publishers of *Progressive Medicine* are to be congratulated upon the forward step they have taken in bringing it out in the Continental manner, and we trust the change will be appreciated by its large circle of readers. J. H. G.

AMERICAN TEXT-BOOK OF SURGERY FOR PRACTITIONERS AND STUDENTS. Edited by WILLIAM W. KEEN, M.D., LL.D., F.R.C.S. (Hon.), and J. WILLIAM WHITE, M.D., Ph.D. Fourth edition, thoroughly revised and enlarged. Philadelphia, New York, and London: W. B. Saunders & Co., 1903.

IN a review of the fourth edition of this book it is unnecessary to do more than comment upon the changes and additions, since its previous editions have caused it to be well known throughout the medical world as an excellent and reliable text-book. It has been brought thoroughly up to date by the introduction of the latest important contributions to surgery. We are glad to see the omission of old illustrations and their places taken up by newer and better ones. Extensive changes have been made in the portions of the book dealing with Surgical Bacteriology, Tumors, Surgery of the Nerves, etc. Five new chapters have been added to the work, which were written by well-known authorities. They deal with Military Surgery, Naval Surgery, Tropical Surgery, Examination of the Blood, and Immunity. These chapters appear at the close of the volume and are published in smaller type in order not to enlarge the book. Although the reading matter has been greatly increased, the size of the book has also been kept down by the use of a thinner paper than was employed in the former editions.

The book will continue to keep its place among the leading single-volume text-books. J. H. G.

THE TREATMENT OF NEURASTHENIA. By A. PROUST and GILBERT BALLET. Translated by PETER CAMPBELL SMITH. New York: Edward R. Pelton.

IT would seem to be a presumptuous undertaking to discuss so large a subject as the treatment of neurasthenia in a small volume of less than 200 pages, some part of which is devoted to etiology,

symptomatology, and diagnosis. By systematic classification the task has, however, been very creditably accomplished. Perhaps the subject is made to appear too simple; but what the book may lack in exhaustiveness it makes up in practical usefulness. Among the exciting causes the authors rightly dwell on the pernicious effects of worry as against the popular notion of overwork, and this applies to all classes of patients of all ages. Work alone is injurious only in the rarest cases.

The discussion of the dyspeptic symptoms occupies a large share of the authors' attention. They do not go so far as to say that indigestion is the chief cause of neurasthenia (indeed the treatment of the entire subject is carried out on the broadest lines), but rightly accord to it a prominent place in the etiology and regard it as one of the most important therapeutic indications. The Weir Mitchell system, to which a special chapter is devoted, is not advocated indiscriminately; in fact the American attitude toward neurasthenia comes in for its meed of criticism as well as of praise at the authors' hands. Rather more stress is laid on hydrotherapeutic treatment, the cold shower-bath being their measure of election. R. M. G.

A MANUAL OF MEDICINE. Vol. V. Diseases of the Digestive System and of the Liver, Diseases of the Peritoneum and of the Abdomen, Diseases of the Kidneys, Diseases of the Ductless Glands. Edited by W. H. ALLCHIN. New York and London: The Macmillan Company, 1904.

THIS volume comprises the diseases of the digestive system and of the liver, diseases of the peritoneum and of the vessels of the abdomen, diseases of the kidneys, and diseases of the ductless glands. The greater part is devoted to diseases of the stomach and intestine, and while the introductory general portion might have been considerably condensed without much loss to the value of the work, the clinical portion suffers from the opposite fault. From the classification of diseases of the stomach it would appear that all the functional gastric disturbances known to medicine come under the general head of gastritis. We look in vain for a satisfactory exposition of the various secretory disturbances or gastric neuroses and the methods of managing such cases. While the article dealing with physical examination of the abdomen and the analysis of gastric contents is excellent in itself, the data obtained by the examinations do not appear to be utilized in the discussion of clinical aspects of disease; the article is so imperfectly correlated with the remaining chapters on the subject as to appear almost wasted. But this is a not uncommon defect in works of composite authorship. The best portions

are those devoted to symptomatology and diagnosis; in fact, while the book is excellent for general reading, it is hardly comprehensive enough for a reference work, not even for practical matters. There is no general discussion of the indications for newer methods of treatment, about which the reader is likely to want information. You will look in vain for information on such points as the use of lavage, the indications for acids and alkalies, or the dosage of hydrochloric acid in the treatment of gastric cases. The writers have apparently ignored most of the recent work in this field.

The greatest conservatism is observed in the chapter on the diseases of the kidneys, although so much work has recently been done in an effort to clear up the classification of diseases of the kidneys and bring clinical varieties into some sort of accord with the pathological findings. The term "nephritis" is used to describe active congestion, and for all other forms of renal inflammation the terms "Bright's disease," acute and chronic, and "granular kidney" appear all sufficient to the authors. Although the title-page bears the date of the present year of grace, there is no mention, for instance, of the question of surgical treatment for diseases of the kidney, that until the present era of rapid advance in surgery were entirely given over to the medical man. On the whole, the present volume is disappointing; it is good so far as it goes, but it does not go far enough. R. M. G.

Les Nerfes du Cœur chez les Tabetiques (Etude Clinique et Anatomo-pathologique). Par le Dr. Jean Heitz, ancien interne des Hôpitaux de Paris. G. Steinheil, editeur, Paris, 1903.

The first part of this thesis gives an account of what is actually known about the cardiac plexus, including the anatomy, histology, organization of the neurones in the pneumogastric nerve, the sympathetic and cardiac plexus, properly speaking. Later, the physiology of the cardiac plexus is discussed with special reference to the sensory fibres. The second part of the treatise reviews and completes all that has been written on the cardiac symptomatology of tabetics. Aortitis, disturbance of cardiac rhythm and cardiac pains are separately considered. Then follow the results of histological examinations of the pneumogastric, sympathetic, and cardiac plexus. This work was done in the laboratories of Dejerine and Merklen. In the majority of cases there is a rarefaction of the medullated fibres in the bundles of the cardiac plexus—a lesion that is comparable to the alterations in the posterior columns of the cervical enlargement. There does not exist any relation between the lesions of the plexus and tabetic aortitis, which is essentially of

syphilitic origin. But the peculiar latency of this aortitis is account for by the lesions of the cardiac plexus and the posterior columns of the cervical enlargement. The cardiac crises probably depend upon lesions of the coronary arteries. The pneumogastric nerves are altered in about one-quarter of the cases of tabes. These lesions are manifested by laryngeal disturbances, tachycardia, and in certain cases by a marked slowing of the respiration. W. T. L.

THE AMERICAN YEAR-BOOK OF MEDICINE AND SURGERY FOR 1904. A Yearly Digest of Scientific Progress and Authoritative Opinion in all Branches of Medicine and Surgery, drawn from Journals, Monographs, and Text-books of the Leading American and Foreign Authors and Investigators. Edited by GEORGE M. GOULD, A.M., M.D. In two volumes. Vol. I., including General Medicine. Vol. II., General Surgery. Philadelphia, New York, and London: W. B. Saunders & Co., 1904.

THE *American Year-book* hardly needs an elaborate introduction to the profession. Throughout the years in which it has been published it has maintained the very highest position as a standard encyclopedia of medical and surgical progress. Dr. Gould has associated with him a staff of men of the greatest ability, and their work is marked by a conscientious thoroughness which is often lacking in writings made up from abstracts in current literature. The book is in two volumes, and constitutes a standard work of reference which should be in the library of every medical man who wishes to keep up to date in his profession. F. R. P.

THE LYMPHATICS. General Anatomy of the Lymphatics. By DELAMERE. Special Study of the Lymphatics in Different Parts of the Body. By POIRIER and CUNEO. Authorized English edition. Translated by CECIL H. LEAF. With 117 illustrations and diagrams. Chicago: W. T. Keener & Co., 1904.

A GOOD treatise upon the lymphatics is greatly to be desired, for an accurate study of the subject is, among other things, of practical value. The present volume is essentially good. It is divided into two parts. The first part takes up the subject of the lymph, the leukocytes, the development of the lymph vessels and lymph glands, and the histology of the adult structures. A short historical résumé precedes each discussion, and an extensive bibliography

is appended to each chapter. The conclusions regarding the origin and structure of the lymph vessels agree with the results of the latest researches on this subject, but it is probable that in a future edition the recent work of Sabine will be used to advantage in the chapter dealing with the origin of the lymph glands and lymph heart.

The second part deals with the distribution and arrangement of the lymph vessels and glandular groups. Each glandular group and its accessory lymph vessels is considered separately, while reference is often made to the course of metastases from malignant growths affecting different organs arising in various parts of the body. The numerous plates and drawings form a valuable addition to the text. The author's many researches upon the anatomy of the lymphatic system stamp the book with a certain degree of individuality.

The translation, though generally satisfactory, occasionally lacks clearness, as in the first part of the book, where some of the French is too patently anglicized. The volume is well printed on good paper, and is distinctly to be recommended. W. T. L.

A Manual of Fever Nursing. By Reynold Webb Wilcox, M.A., M.D., LL.D. Philadelphia: P. Blakiston's Son & Co., 1904.

The work consists of the course of lectures delivered by Dr. Wilcox to the nurses in St. Mark's Hospital.

The question of just how much to include and how much to omit in instruction to nurses on medical subjects is one that is always difficult to decide, and is best gauged by the success of the nurses who have taken the course. The author devotes the first four chapters to a consideration of fever from the physiological point of view; considers also the various types, methods of recording symptoms, diagnosis, methods of taking and registering temperatures, the taking of pulse and respiration, and a study of temperature charts. Chapter III. is devoted to general and special treatment, diet during fever and in convalescence, and is followed by a chapter full of valuable advice in regard to the hygiene of the sick room, the conduct of the nurse, and disinfection in general. In the remaining chapters the author takes up the special description of each disease to be considered, and divides the work into several classifications, namely: Infections of Continued Type; Infections of Continued Type with Local Manifestations; Infections of Intermittent Type; the Exanthemata and Thermic Fever. Here and there in the text are distributed temperature charts illustrating special types of fever.

The author's description of mountain fever is of interest as being opposed to the views expressed in the majority of recent text-books, where the disease is commonly described as identical with typhoid fever, being, however, modified by high altitude. Dr. Wilcox speaks of it as a disease caused by an organism resembling malaria, which is injected into the body by the bite of a tick. This disease is characterized by recurrent chills, by a typical eruption, by a continued fever of two weeks' duration, usually by jaundice, and is followed by desquamation and the slow disappearance of the spots, and sometimes by gangrene of the skin over the elbows, toes, fingers, or scrotum. Harvey Reed and Woodring, who have treated many cases, are both of the opinion that mountain fever is not identical with typhoid, but the disease as described by them resembles rather typhoid than that portrayed in this work. This book should prove a help to the nurse in training, as well as to the graduate, and has this advantage as a reference-book that it is not made cumbersome by unnecessary information. J. N. H.

INTERNATIONAL CLINICS. Edited by A. O. J. KELLY, A.M., M.D., Philadelphia, Pa., U. S. A. Vol. I., fourteenth series, 1904. Pp. 304. Philadelphia: J. B. Lippincott Company, 1904.

TREATMENT occupies the first place in this volume, and a prominent one, both from the value and variety of the subjects presented in it. This is especially gratifying to the practical physician who wishes more upon the "what to do" than upon the "what it is" and "how it came to be so," which to many workers seems to be sufficient. The Chloride Reduction Treatment of Parenchymatous Nephritis by Widal and Javas places this therapeutic suggestion upon a sound practical basis and suggests much in the way of betterment of long-continued and generally difficult conditions. In adonidin, a chemical study by Wilcox, a paper illustrated by sphygmographic tracings, shows clearly both the applications and limitations of this little-used remedy. Colloid silver, by Netter and Solomon, gives us the final word upon a much-discussed subject, and with it we are inclined, from our personal experience, to agree. Edes, a veteran in clear-headed logic from his vast experience, offers the question, "What is the cure for neurasthenia?" and answers it in his inimitable way. We will delay the passing of neurasthenia, as one of our neurologists would advise us, until the broad view of the author has taken root and yielded beneficent results. And, finally, McCaskey goes over the Treatment of Gastric Neurasthenia and Allied Conditions, and points out the way in which the physician should travel to keep these patients from hope-

less invalidism. Davis, upon the Treatment of Pneumonia, gives the commonplace facts, but with the added attraction of personal experience. We quite agree that alcohol has been administered with too free a hand, but its entire omission is decidedly difficult in those habituated to its use. Cattell presents an exceedingly readable paper on Cryoscopy, assembling its important literature and reaching thoroughly practical conclusions. With this in hand the average practitioner should have no difficulties. Favill gives one of his thorough expositions of nephritis of gastrointestinal origin. Walsh pleads for an early diagnosis of pulmonary tuberculosis, and gives information as to how it may be reached. Beck, on Angioma and its Treatment, gives an interesting summary, although his illustrations are open to criticism. Clark and Luther critically review Methods of Intestinal Anastomosis. Gaston writes an appreciative paper on the Complications Encountered in the Surgical Treatment of Diseases of the Testicle. An observant traveller, Noble, faithfully records his wandering in quest of surgical novelties, and records his findings in three of the best German clinics. The ingenious Griffith offers a new mallet for surgical use, which impresses us by its attractive theory. Non-operative gynecology, an unfashionable subject, if Davenport's paper receives proper attention, may bring within the purview of the specialist some facts which apparently have been neglected, while Craig believes that there is even a non-operative treatment of chronic ovarian lesions. Peripheral neuritis, by Pritchard, is singularly attractive, both in form and matter. The progress of medicine during the year just passed is presented by Edsall, Bloodgood, and Stevens. Here quality rather than quantity is noticeable, and the result is good, even if imperfect. This volume is more than fully illustrated, and the quality of plates far above the ordinary. To say that this is well up to the standard of its predecessors is but just to an excellent volume of the series. R. W. W.

LEHRBUCH DER GYNAKOLOGIE. By MAX RUNGE. Berlin: Julius Springer, 1903.

To anyone familiar with the first edition of Runge's work no comment is needful regarding this second edition, except to say that it has kept pace with the changes and modifications which our knowledge or the lack of it has in the last few years brought about in our conceptions of the truth of gynecology.

To those who do not know this valuable and most interesting book, we would say that it is in no sense a surgical manual, but that for the man engaged in general practice it is, in our opinion,

one of the best of volumes. It is true that some of the teaching is not in accord with that accepted in this country. This is notably the case in the directions for the repair of lacerations of the pelvic floor and the local treatment of the endometrium.

The chapter on the use of the pessary to correct retrodisplacements is admirable, but the section devoted to the consideration of operative interference in this condition is, in our opinion, poor, as he describes the operation of ventrofixation, but does not mention ventrosuspension. The methods advocated for the operative after-treatment cannot be commended in certain respects.

The chapter on fibroid tumors of the uterus is interesting: as might be expected, he is rather enthusiastic upon the vaginal method of attack. Judging from the experience of operators in America, his opinion as to the curability of cancer of the cervix would seem rather too enthusiastic. He insists, however, most strongly upon the necessity of the early diagnosis, and advocates the dissemination among the laity of scientific knowledge bearing on this point.

The section devoted to syncytioma malignum is very brief. We feel that this is a mistake. The section upon diseases of the ligaments of the uterus, pelvic connective tissue, and peritoneum is particularly well done.

The chapter upon Gonorrhœa is good, with the exception that the local treatment of the disease when limited to the genital tract below the cervix is not detailed as fully as the importance of the subject would warrant. As a whole, the book is, as we have said, a very satisfactory volume for the man who wishes a clear and concise view of gynecology from the non-operative standpoint.

W. R. N.

BLOOD PRESSURE IN SURGERY. AN EXPERIMENTAL AND CLINICAL RESEARCH. The Cartwright Prize Essay for 1903. By GEORGE W. CRILE, A.M., M.D., Professor of Surgery, Western Reserve Medical College; Visiting Surgeon to St. Alexis Hospital; Associate Surgeon to Lakeside Hospital, Cleveland. Philadelphia and London: J. B. Lippincott Company, 1903.

THE careful and extensive experimental investigations which are the subject of this treatise form a valuable and interesting addition to our knowledge of surgical shock and collapse, and will probably have much influence on the scientific treatment of these conditions. The experiments lead to conclusions which are somewhat at variance with the commonly accepted ideas of stimulation. In experimental shock few drugs were found to be of value in relieving the condition or in raising the blood pressure. It is interesting and surprising to learn that therapeutic doses of strychnine are inert and that physiological doses are dangerous or fatal. Cardiac stimulants have

but a limited range of usefulness in shock and may even be injurious, but in collapse they may be useful. In shock saline infusion raises but cannot sustain the blood pressure. Adrenalin was the only drug which was found to have a markedly beneficial effect. It raises the blood pressure in the normal animal, in every degree of shock; when the medulla is cocainized; and in the decapitated animal. Its effects are fleeting, and it should be given continuously. By means of adrenalin the circulation of a decapitated dog was maintained for ten and one-half hours. By the combined use of artificial respiration, rhythmic pressure upon the thorax, and the infusion of adrenalin, animals which were apparently dead as long as fifteen minutes were resuscitated. A pneumatic rubber suit, which produced an artificial peripheral resistance, was found to be of additional value in raising the blood pressure. By means of this apparatus, combined with the procedures just mentioned, a patient, who, from a fatal injury of his brain, had been conventionally dead for nine minutes, was partially resuscitated for thirty-two minutes, during which time a strong heart beat was noted, and he was able to move his head. W. T. L.

CHART OF THE SYMPATHETIC NERVE (Life Size). By BYRON ROBINSON, of Chicago. Chicago: E. H. Colegrove, 1904.

THE operations upon the cervical sympathetic ganglion which have been recently frequently discussed have brought this portion of the nervous mechanism prominently before the surgical world, and it follows naturally, therefore, that the anatomy of this system should be carefully understood by the profession. Robinson's chart will be found of considerable aid in this study. J. H. G.

MODERN MICROSCOPY. A HANDBOOK FOR BEGINNERS AND STUDENTS. Combining: I. Microscope and Instructions for its Use, by M. I. CROSS. II. Microscopic Objects: How Prepared and Mounted, by MARTIN J. COLE, Lecturer in Histology at Cooke's School of Anatomy. Third edition, entirely revised and enlarged, to which is added: III. Microtomes: Their Choice and Use. Chicago: W. T. Keener & Co., 1903.

THE book is not specially prepared for the physician or medical student and could be of little value to those working in the special branches of scientific medicine. There is no attempt to make the book one of reference, and most of the technical methods are given

in a very elementary form. Perhaps the best portion of the book is that devoted to the microscope. Part II., which deals with the preparation and mounting of microscopic objects, is not confined to a consideration of medical subjects. Animal tissues are considered, but there are also chapters upon the preparation of crystals, botanical mounts, and entymological specimens. The metric system is not used. Many of the methods are described too briefly to be clear.

Altogether the book does not seem to be well suited for use in the modern laboratory. W. T. L.

THE STRUCTURE OF THE GLANDS OF BRUNNER. By ROBERT RUSSELL BENSLEY. Printed from Volume X. of the Decennial Publications of the University of Chicago.

THIS monograph consists of a careful histological study of the glands of Brunner of one marsupial and of nineteen placental species, microchemical and staining methods being especially applied to the solution of the problem.

After a general review of the work done on this subject, which shows the various conclusions reached by different investigators, Bensley first describes the glands of Brunner in the opossum; descriptions of these glands of the cat, dog, mink, raccoon, hedgehog, ten genera of rodents, sheep, pig, and man follow.

The results of this investigation show that there is a remarkable uniformity in the nature and structure of the glands of Brunner of many mammals. In eighteen out of the nineteen genera examined the glands are of a pure mucous type. This conclusion is based on the structure of the cells of the glands and on their staining and microchemical properties.

The structure of the cells also supports the conclusion, Bensley thinks, that they are mucous cells. He considers that they are certainly primitively cells of the same type as the pyloric cells; he does not feel, however, that Oppel's theory, which holds that Brunner's glands are developed as a farther downward growth of the pyloric glands into the intestines, can be reconciled with the facts of their distribution and of their ontogenetic development. Bensley believes it to be more probable that they are cænogenetic structures developed in mammals from the hypoblast of the midgut. He does not consider the evidence that he has brought forward to show the glands of Brunner are mucous glands, to exclude the possibility of their also forming digestive ferments in quantities too small to be recognized by present methods.

The monograph covers 146 pages and is supplemented by an extensive bibliography and six plates. G. C. R.

CHARLES WHITE, F.R.S., A GREAT PROVINCIAL SURGEON AND OBSTETRICIAN OF THE EIGHTEENTH CENTURY. An Address Delivered Before the Medical Society of Manchester, October 7, 1903. By CHARLES J. CULLINGWORTH, M.D., F.R.C.P. LOND. London: Henry J. Glaisher, 1904.

IN the general interest which has been taken in the characters of the great medical teachers and surgeons and physicians of London and Edinburgh in the eighteenth century, many really great provincial medical men have been more or less overlooked, and their services to the advancement of the profession neglected. The present address serves to revive the memory of one whose very name is largely forgotten outside of the town of Manchester in which he practised. Dr. Cullingworth's address is accompanied by a number of valuable illustrations, and is a most interesting portrait of a bygone medical worthy. F. R. P.

NERVOUS AND MENTAL DISEASES. By ARCHIBALD CHURCH, M.D. and FREDERICK PETERSON, M.D. Fourth edition. Philadelphia, New York, and London: W. B. Saunders & Co., 1903.

THE fourth edition of a book the size of the volume under consideration should not need extended reviewing. The existence of a fourth edition in such a short time is evidence that it fills a distinct want in its chosen field, and it will be necessary to consider only the changes from the previous edition.

The most important change is the addition of a chapter by Adolph Meyer reviewing the work of the German schools and their influence on the methods of study and teaching of psychiatry. This critical analysis of the development of psychiatric thought and methods covers 38 pages of very fine print. It is a masterly piece of work, and not only thoroughly reviews the subject, but also has the added value of a scientific analysis from one who thoroughly knows his subject and has devoted much thought and work to it. It will, no doubt, convince the reader and the investigator that what we need is "less discussion of generalities and more records of well-observed cases, and especially records of lifetimes, not mere snatches of picturesque symptoms or transcriptions of the meaning of traditional terms." There are many questions about our patients which the average work on insanity does not attempt to answer or even discuss; for those who have not the time or the ability to consult the "productive pioneers" in this field this digest offers the method for arriving at the solution of such questions.

The classification of the previous edition is retained. Although this classification was the subject of much criticism in the reviews

of the previous editions, there is little doubt that a clear-cut clinical description of the "established clinical entities" is of much more value to the student than a more complex classification based on more or less hypothetical and psychological ground. The success of this text-book has established this fact and has also shown that for the purposes of the student it is advisable to combine the study of psychiatry and neurology.

The sections on diseases of the nervous system have not been changed to any extent. New matter has been added on the following subjects: the healing of nerves, intermittent limping, herpes zoster and its relation to disease of the posterior roots, and the myoclonic form of epilepsy. The value of astereognosis and Kernig's sign in the diagnosis of nervous affections has received careful consideration.

The book is well printed on excellent paper, is well illustrated, and carefully indexed. D. J. M.

A Text-book of Operative Surgery, Covering the Surgical Anatomy and Operative Technic Involved in the Operations of General Surgery. Written for Students and Practitioners. By Warren Stone Bickham, Phar. M., M.D., Assistant Instructor in Operative Surgery, College of Physicians and Surgeons, New York; late Visiting Surgeon to Charity Hospital, New Orleans, etc. Philadelphia, New York, and London: W. B. Saunders & Co., 1903.

The object of the author of this work is to offer to the student and surgeon a reliable guide for the various operations of general surgery, and especially to call attention to the surgical anatomy and technic. The subject is presented in a clear and most systematic manner, and but few criticisms can be made of the work.

Parts of the book, such as the chapters dealing with the surgery of the heart and bloodvessels, deserve particular commendation. A careful consideration has been given to the latest operations, and the book may be considered up-to-date.

The illustrations are largely new and thoroughly serve their purpose.

The author has seen fit to exclude from consideration the operations of plastic surgery, which we think is a mistake, since one would naturally turn to such a work to find a description of the more common of these operations, such as harelip and cleft palate. We think this criticism is just, in view of the fact that the author includes the operations upon the female generative organs, which are to be found in every work on gynecology, whereas separate

volumes dealing with plastic surgery are not very numerous and are not possessed by a large proportion of the profession.

For operations upon the extremities we have seen few books which present a more reliable guide.

We are surprised to find that the pyloroplasty of Finney is not described among the operations upon the stomach. Another omission which we consider regrettable is that of Doyen's operation for the radical cure of hydrocele. The operation described for the cure of varicocele is the low operation, and not the high one which is so generally employed at the present time. In comparison with the space devoted to ligations and amputations we feel that the subject of the radical cure of hernia has been given too brief a consideration. A criticism which might be made of the author's style is that a systematic method of considering each operation necessitates considerable repetition, but the justness of this criticism might be questioned.

Looking upon the work as a whole, it can be said that it is one of the best and most reliable books of its kind. J. H. G.

DISEASES OF THE SKIN: AN OUTLINE OF THE PRINCIPLES AND PRACTICE OF DERMATOLOGY. By MALCOLM MORRIS, Consulting Surgeon to the Skin Department, St. Mary's Hospital, London; Corresponding Member of the K. K. Gesellschaft der Aertze in Wien, etc. With two colored plates and fifty plain figures. New edition. Chicago: W. T. Keener & Co., 1903.

THIS new edition of Mr. Morris' manual of *Diseases of the Skin*, which is apparently the third, contains a considerable amount of new material and a number of new illustrations. Sections descriptive of *blastomycetic dermatitis, porokeratosis, parakeratosis variegata*, and of the so-called *tuberculides* of the French authors are the most important of the new additions to the text.

We note that the author is ultraconservative, perhaps, concerning the use of the Finsen light, and more especially the *x*-ray, in the treatment of lupus vulgaris, the latter agent being dismissed in less than two lines. Tuberculin is still believed to be a useful remedy in this disease, an opinion which probably finds but few supporters at the present time.

The nature of Darier's "corps ronds" in keratosis follicularis (*psorospermose folliculaire vegetante*) is regarded as still an open question; but if we are not mistaken, Darier himself sometime ago gave up the idea that these bodies are parasitic.

Except in a few minor matters the present edition is well up to date, and the practitioner will find it, like previous ones, a clear and faithful presentation of dermatology as it is taught to-day.

M. B. H.

PROGRESS

OF

MEDICAL SCIENCE.

MEDICINE.

UNDER THE CHARGE OF

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The Diagnosis of Gastric Carcinoma.—JULIUS SIGEL (*Berl. klin. Wochenschr.*, 1904, xli. pp. 299, 338) has investigated in Ewald's clinic the value of the newer methods suggested as useful in the diagnosis of gastric carcinoma. The tryptophan reaction proposed by Erdman and Winternitz he found unsatisfactory. It was positive in only 2 out of 15 carcinoma cases; this corresponds with the previous report of Glässner, who found it positive in 1 out of 12 cases of carcinoma, in 2 out of 6 cases of ulcer, and in 1 case of gastric catarrh.

Although the method of determining the amount of albumin and urea in the washings of the fasting stomach, as proposed by Solomon, does not lead to absolute results, Sigel thinks it of some aid in diagnosis. While 4 cases of ulcer gave albumin and urea values much below the cases of carcinoma, a case of benign stenosis of the pylorus following an ulcer gave high values for both, and it is just in such cases of stenosis that a differential diagnosis is of the highest importance. The differences in cases of chronic gastritis and carcinoma are very marked in his table, and although he admits that a case of simple gastritis might rarely produce an excessive secretion of albumin, neither he nor Solomon have observed such a case. In the case of an obscure abdominal tumor with indefinite gastric findings he correctly ascribed the tumor to the stomach on the basis of high albumin and urea values in the washings. Gluzinski's[1] method to differentiate simple gastric ulcer from carcinoma developing in the base of an old ulcer by determining a relative insufficiency in the hydrochloric acid secretion likewise gives valuable but not absolute results. Out of 13 cases operated on or followed clinically, in 12 this method gave results corresponding

[1] The method of Gluzinski is to estimate the amount of free HCl in the stomach at three periods on the same day: 1. In the morning, fasting; the stomach is washed. 2. Three-quarters of an hour after a test breakfast of egg-albumen. 3. Four hours after a test meal (beefsteak).

with the correct diagnosis. In 1 case, however, in which the finding pointed to carcinoma the patient recovered completely. In 2 further cases in which there was a palpable tumor and all evidence pointed to the existence of a malignant growth, the Gluzinski method gave constant high free HCl values, and both proved to be benign.

In a third case, however, in which the free hydrochloric acid ran 17, 16, 22, the tumor was found at operation to be a carcinoma.

Sigel finds that the estimation of the fatty acids in the urine, a procedure advised by Rosenfeld, gives results too variable to be of any value in diagnosis.

Factors Influencing the Coagulation of the Blood in the Living Organism.—Boggs (*Deut. Arch. f. klin. Med.*, 1904, lxxix.), has investigated very thoroughly the influence of various substances in reducing the coagulation time of the blood. In his first experiments with gelatin he obtained a marked influence on six guinea-pigs, the coagulation time dropping rapidly from a normal of 6 minutes to as low as ½ to 1 min. in twelve to twenty-four hours, and rising again to the normal in the course of several days. This result is unique, and he was never able to obtain it again, although he varied the experiments in every conceivable manner and used various breeds of guinea-pigs. In all instances the influence was negative or so slight that it fell within the range of normal variation. He is inclined to explain the remarkable result to a racial peculiarity. With gum arabic the time was slightly reduced (from 5.5 and 5 min. to 3.5 min.), but the influence lasted only from 15 to 30 min. With cows' milk the result in two instances was a marked negative influence (from 4.2 and 6 to 12 and 11.5 min.) after a short and slight positive phase (4 min.). The serum of different animals injected into guinea-pigs gave various results. Serum from a goose produced marked reduction in the coagulation time (from 4.3 to 2 min.), while dogs' serum gave partly positive, partly negative phases, the two often following one another in rapid succession. Antileukocytic serum had no effect on the coagulation time in a dog. Extracts of various organs (thymus, liver) showed constantly a positive action. From a clinical standpoint the results with the calcium salts were the most interesting. In some of his investigations he substituted calcium lactate for the chloride, which has the same effect on the coagulation time, is tasteless, and is well borne. In his experiments on animals with calcium chloride a reduction in the coagulation time was never missed, the effect lasting on an average from two to three hours. In a guinea-pig, for instance, with a coagulation time of 5 min., 25 c.cm. of 1 per cent. soluble calcium chloride was introduced intravenously at 6.30 P.M. At 6.48 P.M. the coagulation time was 1.5 min.; at 7, 1.5 min.; at 7.10, 2.5 min.; at 7.35, 2.5 min.; at 10.30 A.M., 6 min. The calcium salts given to human beings by mouth produced a distinct reduction in the coagulation time, this result being absent in only a single instance. Examples: from 5 min. to 3.2 min., from 7.7 min. to 5 min., from 6.7 min. to 3.7 min., from 9.7 min. to 6 min. In one instance of purpura there was a reduction of from 21 minutes to 6.

[These observations quite support the experience in Professor Osler's wards, where the value of the calcium salts in increasing the coagulability of the blood, especially in cases of jaundice in which surgical interference is necessary, has been clearly proven.—W. S. T.]

A Contribution to the Study of Paroxysmal Hæmoglobinuria.—DONATH (*Zeit. f. klin. Med.*, 1904, Bd. lii., Heft 1 and 2) reports very fully three cases of paroxysmal hæmoglobinuria induced naturally and experimentally by exposure to cold, and reviews the various attempts that have been made to explain the origin of this condition. In numerous experiments made with suspensions of red blood cells drawn from the finger before, during, and after attacks, he was unable to demonstrate any abnormal susceptibility of the corpuscles to cold, agreeing with the observations of Ehrlich, Boas, Chvostek, and others. Contrary to the findings of Lichtheim and Chiaruttini, there was no solution of the hæmoglobin when the blood was coagulated at various temperatures. All these cases showed slightly diminished resistance of the red blood corpuscles to mechanical insults, but the results varied considerably in the same case at different times, and there was a marked individual difference between the several cases. The variation from normal was always small and altogether out of proportion to the ease with which exposure to cold precipitated an attack. There was no such susceptibility to mechanical influences as apparently existed in the cases of Chvostek and Chiaruttini. Hæmoglobinuria occurred in one case after simple ligature of the finger or arm. In the other two cases the procedure gave negative results. Luzzatto and Sargente have shown that this hæmoglobinuria following stasis is not due to mechanical injury, but to thermic influences, the solution of the hæmoglobin not occurring when the normal temperature of the ligatured extremity is maintained. Donath was unable to demonstrate any direct decrease of resistance in the red blood corpuscles to cold or mechanical influences. He attempted to produce evidence in support of Ehrlich's view that in these cases under the influence of cold the blood serum gained a red blood corpuscle dissolving property. The serum obtained during an attack and during the interval was tested in varying dilutions with the red blood cells of the same individual, of normal individuals, and of patients with other diseases. In several instances the serum showed a slight hæmolytic effect on the cells of other individuals, but the effect was the same with the interval serum and the attack serum, and in no way above the normal isolytic action exhibited by various sera. In only one instance did the attack serum show a hæmolytic effect slightly above the interval serum.

In none of the three cases did the interval serum show autolytic properties, and although this is opposed to results published by other authors, he concludes that the property must at least be variable and cannot be accepted as the rule. In one case the attack serum showed a slight autolytic property.

Donath points out that although he has been unable to demonstrate the presence of a hæmolysin in his cases, this is no argument against the existence of such a property; for if a toxin be formed there is opportunity enough for it to become immediately anchored, and it could be demonstrated only if present considerably in excess of the amount bound by the susceptible red blood corpuscles, *i. e.*, those with suitable receptors. Attempts to "activate" inactive interval serum by the addition of attack serum, supposing complement to be produced in excess during an attack, proved fruitless, as did also efforts to reactivate inactive attack serum by adding active interval serum or active normal serum on the supposition that amboceptors might be produced in excess.

In order to see if the red blood corpuscles themselves were more susceptible to hæmolytic influences, he subjected the cells from his cases to serum from other individuals, to hæmolytic immune serum and to certain red blood corpuscle dissolving substances, such as abrin and ricin. The results show that the red blood cells in his cases have the same relation to human serum from other sources and to hæmolytic immune serum as the erythrocytes of other cases, while abrin and ricin agglutinate them in somewhat weaker solutions. By collecting serum from the arm of different patients after having put on a compression ligature and immersed them in cold water for from six to ten minutes, he was able to show in two out of four cases a slightly increased hæmolytic action of such serum on the red blood corpuscles, not only of the hæmoglobinuria cases, but also of a number of other patients.

Donath thinks he is justified in concluding that the blood disintegration does not follow as a result of the direct action of cold or of purely mechanical influences upon the red blood corpuscles, but is due to hæmolytic properties of the serum. He believes this property to depend upon substances similar to the serum hæmolysins.

Pneumococcus Peritonitis.—ANTON GHON (*Wiener klin. Woch.*, 1904, xvii. p. 267) reports four cases of acute fibrinopurulent peritonitis due to diplococcus pneumoniæ. The first case was that of a girl, aged twenty-three years, who was taken suddenly ill with pain in the abdomen and died on the fourth day of general peritonitis. Autopsy showed a diffuse fibrinopurulent peritonitis and a perforated gastric ulcer. Cultures from the exudate gave a pure growth of pneumococcus. In Case II. there was a diffuse serofibrinopurulent peritonitis following perforation of a gastric carcinoma. Cover-slips from the exudate showed very numerous definitely lancet-shaped diplococci, retaining the Gram stain, and a small number of bacilli. The colonies on agar plates were chiefly of pneumococcus. Case III. was one of diffuse fibrinopurulent peritonitis developing eight days after gastroenterostomy for carcinomatous obstruction of the pylorus. Cover-slips from the exudate showed principally Gram-positive lancet-shaped diplococci and a few short bacilli. In cultures only a bacillus identified as colon grew, but inoculation of the exudate into a mouse produced death in twenty-four hours from pure pneumococcus septicæmia.

In Case IV. there was a deeply ulcerated gastric carcinoma without perforation, marked secondary hepatic and glandular involvement, fibrinopurulent peritonitis localized about the region of the pylorus, and fibrinopurulent meningitis. Cultures from the meninges and the swollen glands along the greater curvature gave a pure growth of pneumococcus. Cover-slips from the peritoneal exudate showed only lancet-shaped Gram-positive diplococci, but in cultures there were also a few colonies of colon bacillus and two colonies of staphylococcus aureus.

Although in three of these cases the pneumococcus was not found in pure culture, Ghon feels justified in assuming that it was the active agent. He quotes Jensen, who, in twenty cases of pneumococcus peritonitis, found three following perforation of gastric ulcer, and Brunner, who collected twenty-two cases of perforated gastric ulcer, examined bacteriologically and found four due to pneumococcus. Ghon considers the mouth and pharynx the source of infection. In Case III. there

was a lobular pneumonia from which a pure culture of pneumococcus was obtained, while clinically the pulmonary involvement preceded the symptoms of peritonitis.

SURGERY.

UNDER THE CHARGE OF

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The Surgical Treatment of Epilepsy.—J. CHALMERS DA COSTA (*Medicine*, February, 1904), in an admirable review of this subject, states that in determining upon the course of treatment for a person suffering with epilepsy due consideration should be given to the possibility of effecting cure by or of obtaining benefit from a surgical operation. An opinion to be of value must emanate from some one who possesses a scientific knowledge of epilepsy and has examined the patient with painstaking care; who has secured an accurate history of the sufferer's previous life, of his diseases and accidents, of his hereditary tendencies, and of the exact character of his convulsive seizures, and, finally, the decision should be made by one who has a surgical conscience. Operating without conscience is not only ruin of the soul; it is often the ruin of the patient, and it is always to the infinite disgrace of the medical profession. It is known that epilepsy is quite common, but exactly how common is somewhat uncertain. According to Spratling, in the United States one person out of every five hundred of population is epileptic, and in Europe the proportion is slightly less.

The surgeon must always bear in mind that many and quite different causes have been assigned for epilepsy, and that our conception of the pathology of the disease is not an established certainty, but rather a probability or a guess. The conclusions that one should draw from the views of modern students are that epilepsy is a diffuse lesion of the cortex of the brain, and that the conditions pointed out as causative may not infrequently be the result of the disease. Epilepsy is usually regarded as without danger to life, but Spratling points out that in this disease there is a distinct tendency to sudden death. Occasionally, though very rarely, patients recover from epilepsy without any treatment at all. If cases are treated early and carefully, and are placed under proper control, from 8 to 10 per cent. may be cured, but if the attacks have lasted over two years or have been very violent there is almost no hope of effecting a cure by medicine. Thus it may be seen that we are dealing with a distressing and usually incurable disease,

which, as a rule, unfits the patient for duties of active life, and which, as a general thing, gradually drags him into the ruin of dementia. In such a dreadful condition there is every justification for the performance of operation, if operation even offers a chance. All sorts of methods of treating this disease have been adopted in the past, and every few weeks a new method is suggested. There is scarcely a drug in the *Pharmacopœia*, there is hardly a material in the vegetable world or in the mineral kingdom that has not been at some time or other employed and lauded. Although modern medical treatment has been somewhat more successful than the ancient plans, epilepsy is still with us to a fearful extent.

In setting forth the surgical treatment of epilepsy the author states that he will not discuss the various peripheral operations that may be performed with the idea of eliminating a focus of irritation or of intercepting some irritant impulse. That such operations are occasionally beneficial is undoubted. The author has seen great improvement or apparent cure follow the removal of a tender cicatrix and follow the performance of circumcision in a case of phimosis. Nevertheless, the curative influence of such operations is occasional rather than common, and it is the purpose of this article to dwell particularly upon operations upon the skull and brain. The confidence in the curative value of brain operations in epilepsy has very much diminished in recent years; in the author's opinion less than 5 per cent. are cured by this means. Previous observers have been deceived by the fact that any operative traumatism may for a time improve, and even greatly improve the manifestations of the epileptic condition. This phase of the question was most ably presented some years ago by Dr. J. William White in his well-known article upon the curative effects of the operation *per se*. A case should not be reported as cured until at least three years have elapsed since the operation was performed, and five years is probably a safer limit. Operation in any case should only be resorted to after a most careful study of the patient, and preferably a neurologist should be associated with the surgeon in making this examination. Then, too, the patient should be under observation for some days by either a physician or a nurse, so that the convulsion and sequelæ may be accurately noted in writing, and this report should prove of great help in reaching a conclusion. From a surgical standpoint epilepsy should be classified into different forms, in some of which operative interference is distinctly contraindicated, for the reason that it not only does not do any good, but in some cases may make the patient distinctly worse. 1. Idiopathic epilepsy: Uncomplicated cases of essential epilepsy should not be operated upon, because operation will never bring about a cure. However, if an epileptic suffers with persistent localized headache, it is justifiable to trephine, to open the dura, and to inspect the brain. Even if no cause for the headache be discovered the patient may often be relieved or cured of the pain. In such a case an osteoplastic resection should not be performed, and the trephine button should not be replaced. In status epilepticus the cerebral pressure is notably increased, and trephining with drainage of the ventricle is justifiable to relieve pressure that might cause death. Operation in ordinary essential epilepsy for the relief of the increased intracerebral pressure, as recommended by Kocher, has the objection that there is the danger not only of infection but also of hernia cerebri, and,

as Clark has pointed out, this excessive intracerebral pressure is a result rather than a cause of epilepsy. Jaboulay's operation of the excision of the cervical ganglia of the sympathetic for the relief of essential epilepsy has not been followed by very brilliant results. Winter has collected 122 cases, in one-half of which there was no apparent improvement. 2. Idiopathic epilepsy with focal symptoms: Many of these cases, which begin within the first two years of life, are due to unrecognized cerebral infantile palsy. If, from the very start, the convulsive attacks have had a local beginning, and if the surgeon has seen the case within two years of the first attack, it is proper to trephine and excise the irritated portion of the cortex. This is true whether the convulsions remain partial or spread to the rest of the body, and whether consciousness is lost or not. Operations in children are more hopeful than in adults. After the condition has persisted for two years, however, operation offers practically no hope of cure, as the association fibres are by that time hopelessly degenerated. In performing this operation it is impossible to avoid removing more of the cortex than merely the excited centres of the motor region. After the operation there is, of necessity, paralysis of the parts controlled by the extirpated centres. This paralysis is usually first temporary, though the finer movements are never regained. The earlier the operation is done the better is the prognosis. In these cases an osteoplastic operation should be performed. In those cases of genuine essential epilepsy in which after a time the convulsions have taken on a focal character operation offers no hope of curing the disease, although even in these cases operation may become necessary if the great frequency of the attacks produces exhaustion and threatens life. Again, it is possible that in a case of essential epilepsy a gross cortical lesion may develop and may lead to the production of Jacksonian seizures. In such a case one might be driven to operate for the gross lesion, without having any hope of curing the generalized epilepsy. 3. Traumatic epilepsy: When epilepsy ensues upon traumatism the attacks frequently do not begin until some months or a year or more have elapsed; in fact, several years may elapse between the time of the injury and that of the development of epilepsy. An injury may be followed by generalized epilepsy or by Jacksonian epilepsy. The more time that has elapsed between the reception of the injury and the performance of the operation the worse is the prognosis. Traumatic Jacksonian epilepsy gives a better prognosis from operation than does any other form of the disease; where there is a distinct neurotic history the prognosis is worse than when such a history is absent. The prognosis is much better in the Jacksonian than in the generalized form. Every operation in traumatic epilepsy is exploratory. Any obvious lesion should be extirpated, but if nothing be found on exploration, and if the attacks have been distinctly focal in origin, it is justifiable to extirpate the motor centre from which the discharge seems to originate. When the injury is in the motor region the chances of cure are much better than when the sensory region is involved, but when the frontal region has been the seat of injury operation offers very little hope of cure. 4. Jacksonian epilepsy due to gross brain disease: This condition demands the treatment of the underlying brain disease. 5. Epilepsy following infantile cerebral palsy: In the cases associated with congenital cerebral palsy operation in childhood is justifiable, but not promising; but when the patient

has reached adolescence operation is useless. 6. The posthemiplegic epilepsy of adults: In these cases operation is entirely valueless.

The conclusions deducible from the preceding remarks are as follows: 1. Operations for epilepsy are distinctly disappointing and rarely curative, and are indicated in only a small proportion of cases. 2. They frequently produce temporary benefit. 3. They may save life, but they are not entirely free from danger, and occasionally leave the patient worse than before. 4. The mortality, though small, is not inconsiderable. 5. The actual number of complete recoveries is probably under 5 per cent. 6. No case should be claimed to have been cured until from three to five years have elapsed since the operation. 7. Even after operation medical treatment and supervision should be exercised for a long period of time.

THERAPEUTICS.

UNDER THE CHARGE OF

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Adrenalin in Ocular Therapeutics.—M. DARIER, at a meeting of the Société d'Ophthalmologie de Paris, spoke as follows of the use of this drug in ophthalmology: As a means of diagnosis of beginning iritis it is very useful when there is hesitancy in instilling atropine. By means of it episcleritis may be easily differentiated from pustule of the limbus. Certain doubtful forms of conjunctivitis may be recognized as granular by its use. From a therapeutic point of view, adrenalin exaggerates the action upon the eye of the various alkaloids; cocaine anæsthetizes an inflamed eye without otherwise affecting the organ if adrenalin has been first applied. Combined with it, cocaine will render great service in conjunctivitis and lessens the pain of topical applications as well. Its use makes catheterization of the tear-duct unnecessary, for a simple injection does away with the stenotic action of the mucous membrane. When eserine or atropine fail in their usual action upon the pupil, combination with adrenalin obviates the difficulty. Its use facilitates operations upon the conjunctiva because of the ischæmia which it produces, but after iridectomy its employment may be followed by hemorrhage into the anterior chamber. In corneal lesions, such as ulcerations, it should not be used, but in episcleritis it produces excellent results.—*Revue de thérapeutique*, 1904, No. 9, p. 313.

Adrenalin in Glaucoma.—DR. GRANDCLÉMENT reports an instance of severe and marked glaucoma cured by this agent. The treatment consisted in the instillation into the affected eye every half hour for three consecutive days of a 1:5000 solution of adrenalin. The course and outcome of this case encourage the belief that it may be possible to cure the various forms of glaucoma by this simple means,

doing away with the difficult and painful operation of iridectomy. The chief element in the treatment is to know how to employ this strong and dangerous vasoconstrictor. Two points must be carefully noticed: (1) To instil the adrenalin sufficiently long to momentarily stop the secretion of the intraocular fluids and to cause a perceptible diminution of the tension. (2) To carefully avoid the production of a dangerous and irremediable hypertension.—*Journal de médecine de Paris*, 1904, No. 17, p. 167

Adrenalin in Cancers of the Respiratory Passages.—M. MAHER has employed this agent in cancers of the larynx and of the mouth with the result of improving the condition of the patients, suppressing the tendency to hemorrhage and lessening the pain. M. ICHARD has in a number of cases obtained an almost complete cicatrization of the ulcerating surfaces and has stayed the growth of the lesions in one patient for a period of sixteen months. A 1 : 1000 solution was at first employed, but it had the disadvantage of deteriorating rapidly upon exposure to the air. A permanent powder, such as the following: adrenalin, 5 parts; tartaric acid, 5 parts; sodium chloride, 90 parts, from which a fresh solution of 1 : 1000 strength may be readily made, obviates this difficulty. The applications of the adrenalin are usually made every two days. By this treatment epitheliomata of the larynx, of the tongue and of other regions, such as the breast, are greatly relieved.—*Journal de médecine et de chirurgie pratiques*, 1904, No. 7, p. 258

Iodine Glycerole in Granular Conjunctivitis.—DR. JABLOWSKI has obtained excellent results from the employment of this remedy in this condition. The strength of his solution is 1 part in 60. With this he paints the inflamed conjunctiva. The application is only slightly painful, and the treatment seems to have a particularly favorable action upon old granulations which have become acutely inflamed and in recurrent cases which have been treated with silver nitrate. Also in trachomatous pannus the iodine acts well and is likely to cause permanent cure. The duration of the treatment varies with the gravity of the lesion. Cure is usually complete after from three to four months of daily applications.—*La semaine médicale*, 1904, No. 15, p. 120.

Intravenous Injections of Sodium Salicylate in Rheumatism.—DR. FELIX MENDEL reports excellent results from this treatment, even in rebellious cases. His formula is as follows, the caffeine being added to lessen the tendency to local irritation: sodium salicylate, 2.2 drachms; caffeine, 20 grains; distilled water, 12.5 drachms. Thirty minims of this solution are injected and repeated twice a day in severe cases. In those less severe the injections may be given as infrequently as every three days. In 80 cases of monarticular and polyarticular rheumatism, sciatica, lumbago, and rheumatic pleurisy so treated the effects have been very good. The injections are given into one of the larger veins of the arm.—*La semaine médicale*, 1904, No. 16, p. 128.

Quinic Acid in Gouty Conditions —DR. J. WEISS advocates the use, in these conditions, of quinic acid alone, or, perhaps, preferably, in combination with lithium, the combination being termed urosin. In

dosage of from 3 to 4 drachms daily it diminishes the excretion of uric acid appreciably and increases the output of hippuric acid to a considerable extent. In arthritic conditions with pain, stiffness and tophi, the administration of from 45 to 75 grains daily, best taken dissolved in water after meals, in divided doses, affords marked relief. The author considers that in urosin we have a remedy for the uric-acid diathesis as efficacious as is quinine against malaria or salicylic acid against acute rheumatism.—*Wiener klinische therapeutische Wochenschrift*, 1904, No. 18, p. 493.

Sodium Sulphanilate in Exophthalmic Goitre.—Dr. Kirnberger bases his theory of this treatment upon the idea that the condition is an autointoxication due to the superproduction of iodothyrin by the hypertrophied thyroid gland. Knowing the efficacy, as exploited by Ehrlich, of sulphanilic acid and its sodium salt in the treatment of iodism, the author has used these means in exophthalmic goitre. The dosage was at least 2.5 drachms per day, which was well tolerated and productive of good results. In all cases the drug had a calming effect, increased the patient's strength, and diminished the tachycardia. In most cases the tremors and the size of the thyroid were uninfluenced. The author concludes that the drug is merely palliative in its effects and to be employed to relieve the symptoms, either alone or in connection with other treatment.—*Revue francaise de médecine et de chirugie*, 1904, No. 16, p. 381.

The Treatment of Cardiac Insomnia.—Dr. Feilchenfeld states that insomnia at the commencement of cardiac insufficiency manifests itself thus: After a deep slumber of two hours or so the patient will awake with obstinate oppression and palpitation; further sleep is often impossible, and the same phenomena reappear night after night. Upon examination of the heart nothing is found, and the insomnia is attributed to nervousness. Such sleeplessness should be treated at first by hygienic measures and hydrotherapy; later, if necessary, hypnotics (morphine, sulphonal, codeine) may be prescribed, but only in small doses. Large doses do not cause sleep, but aggravate the patient's condition. The author has achieved good results from 0.25 grain of powdered digitalis, combined with 0.125 grain of morphine hydrochlorate, given during the evening, and 0.125 grain of sulphonal given several times during the afternoon. Large doses must be avoided, and it is remarkable what good results are obtainable.—*Berliner klinische Wochenschrift*, 1904, No. 11, p. 282.

The Medical Treatment of Pyloric Stenosis.—M. Thaon states that the first consideration in the treatment of this affection is regulation of the diet. Strict milk diet, three or four quarts in twenty-four hours, should be prescribed, together with wet compresses over the epigastrium. When there is severe pain bismuth, in doses of from 3 to 4 drachms, mixed with 6 ounces of water, should be given. Following this treatment a gradual return to solid diet is allowed. Sodium bicarbonate is useful to correct hyperacidity, and in fermentative conditions, antiseptics, such as ammonium fluoride, iodized sulphur, benzonaphtol, betol with bismuth salicylate, resorcin with bismuth, or spraying with silver nitrate solution, may be employed. When there is pyloric spasm,

large doses of oil are recommended, and a properly fitting girdle, together with massage, may prove efficacious. When the stasis is considerable we may have recourse to hypodermic injections of about 12 drachms of serum, followed by gastric lavage, with 0.9 per cent. salt solution. In cases with moderate stenosis simple lavage may be employed and followed by lavage with powdered meat; otherwise the diet should be exclusively of milk. In tetanic conditions lavage is also useful.—*Revue francaise de médecine et de chirurgie*, 1904, No. 18, p. 424

Isopral, a New Hypnotic.—Dr. Impens reports this substance is trichloro-isopropylic alcohol and possesses the following properties: It crystallizes in white crystals fusible at 49° C., but subliming at ordinary temperatures. It is soluble in alcohol, ether, and water, but in the last less so than chloral, to which substance isopral is comparable. It has a camphor-like odor and an aromatic and slightly irritating taste. Upon contact with alkalies and heat it loses its chlorine without the formation of chloroform. Physiologically the action of isopral is twice as intense as that of chloral, without an equal possibility of poisoning.—*Journal de médecine de Paris*, 1904, No. 16, p. 157.

Intratracheal Injections of Eucalyptol in Pulmonary Tuberculosis and Chronic Laryngitis.—M. Atony concludes, as the result of experiments, that the treatment of certain forms of chronic laryngitis and of most types of pulmonary tuberculosis by intratracheal injections of oil of eucalyptol has these advantages. It is easy of application, well borne by the patient, and brings about good results. By it the digestion is not disturbed, and it is less painful than the various hypodermic treatments. The patients do not object to it, it does not interfere with their work, and the technique of its application is simple. The author uses a mixture of 5 parts eucalyptol to 95 of olive oil at first, but gradually increases its strength until an 8 per cent. mixture is reached. The first injection consists of 15 minims, and if well borne the quantity is increased up to 45 minims, and the treatment is given daily or upon alternate days. Of 15 cases of tuberculosis, 3 were benefited, and in 2 cases of laryngitis regularly treated the results were most favorable.—*Archives de médecine et de pharmacie militaires*, 1904, No. 5, p. 381.

Beer Yeast in Exanthemata and Erysipelas.—MM. Presta and Tarruella have treated a number of patients with scarlatina and measles with beer yeast with rather remarkable results. Most of the observations were taken during epidemics in which there were numerous fatal cases and cases complicated with meningitis, bronchopneumonia, nephritis, etc., but the patients treated with the yeast, for the most part, became convalescent within three or four days after the appearance of the exanthem, and in no case so treated did the disease last longer than sixteen days. The yeast seems to cause a marked diminution in the desquamation of scarlet fever, and under its influence the eruption of measles quickly disappears. After a few doses the scarlatinal angina disappears, as also does the albuminuria, if it be present. Twenty-four cases of erysipelas were markedly influenced by the administration of the yeast; the high temperature and other symptoms quickly disappeared. In four days the local lesions became merely slight redness and infiltration, and these manifestations disap-

peared by the sixth day, followed by desquamation. The constitutional symptoms ameliorated within forty hours and disappeared in about three days. In advanced cases with complications, such as anuria, cardiac insufficiency, hyperpyrexia, and pulmonary congestion, the treatment produced good results, and there was no recurrence of the malady, even though some of the cases had suffered previous attacks. In all cases the dosage was from 4 to 6 coffeespoonfuls of the dry yeast every twenty-four hours.—*Revue française de médecine et de chirurgie*, 1904, No. 15, p. 354.

PEDIATRICS.

UNDER THE CHARGE OF

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The Association of Chorea with Tænia Solium.—JAMES BURNET, of Edinburgh (*British Journal of Children's Diseases*, April, 1904, p. 147), reports two interesting cases under this title. The first case was that of a girl, aged seventeen years, but looking very much younger. Her illness was of five days' duration, the movements beginning upon the right side, but rapidly becoming generalized. She had had a slight choreic seizure four years before. It was impossible to obtain a history of rheumatism, although there was a strong family tendency to that disease, the mother being rheumatic and a sister having developed chorea following an attack of acute rheumatism. The patient's movements became so violent that at times she had contrived to throw herself out of bed upon the floor. There was no murmur, but the heart seemed to be dilated.

Under the ordinary treatment with salicylate of sodium there was no improvement until, the possibility of tapeworm being considered, a dose of male fern was administered, and a large tænia solium, without the head, was expelled. From this time she continued to improve, and after the expulsion of a large number of segments with the head, following another dose of the anthelmintic, she made a prompt and complete recovery.

The second case was that of a girl, aged twelve years, who, a year before the onset of her chorea, had had an attack of pleurisy, with pains in both lower limbs. She had never been quite well since that attack, having become pale and nervous.

There was no cardiac murmur, but the second pulmonary sound was accentuated. She was given antirheumatic treatment, with arsenic in addition. Her condition after several weeks became serious, with a temperature of 101°, rapid pulse, and embarrassed respiration. Having in mind his previous case, which resisted routine treatment, the author

resolved to try the effect of an anthelmintic upon this patient. Accordingly, a dose of extr. filicis liq. was administered, which resulted in the expulsion of a complete tænia solium of fair size. There was a rapid disappearance of the symptoms almost immediately. The author believes that chorea, even in rheumatic subjects, may have its origin in causes other than the rheumatic toxin, and that the possible presence of tapeworm should always be borne in mind in those cases which are not amenable to the usual routine treatment.

Enuresis in Children.—PERCY LEWIS (*British Journal of Children's Diseases*, February, 1904) gives a plan of treatment for this troublesome condition, which he has successfully carried out in his practice.

His observations show that most of the subjects of this complaint are children unhealthy in aspect, of irregular habit in regard to their diet, and living mostly upon farinaceous and saccharine foods; that they are difficult to arouse from sleep, and even if taken up at night quickly relapse into a kind of stupor upon being returned to bed. He has also noted that these children pass larger quantities of urine in a single night, which is of low specific gravity, of neutral or alkaline reaction, and with a deposit of triple phosphates or oxalates. He infers from the way in which the bed is "deluged" that the bladder is not emptied until it is full, and that on account of the unirritating urine the "call" to the central nervous system is sufficient only to start the necessary reflex for emptying the bladder, but not enough to awaken the patient.

This condition, he considers, is analogous to the polyuria of infants fed upon starchy foods, whose symptoms rapidly disappear under a proper change of diet. So in the older children, with both polyuria and enuresis, a marked improvement is noticed after the introduction of a rigid antidiabetic diet. As most of the cases are much depressed in health, a general tonic treatment is recommended at the same time. Without any other treatment he has observed rapid improvement, and finally cure in many cases, both in private and in hospital practice.

Influence of the Ingestion of Chloride of Sodium upon the Weight of Nurslings.—P. NOBECOURT and G. VITRY (*Revue mensuelle des maladies de l'enfance*, March, 1904, p. 120) have investigated the influence of chloride of sodium upon the weight of nurslings in fourteen cases in addition to the series of eight cases reported by them last year (*Bull. de la Soc. de Pédiatrie*, December, 1903). The amount of salt given was 0.25, 0.5, and 1 gram per day, which was administered in one or two doses in a little boiled water before a nursing. Comparison of the babies' weight-change for periods of seven days with and without the addition of salt to the diet showed in general that increase in weight was greater during the weeks when they took salt than in the weeks without it. By comparing the increase in weight per 1000 gm. of body-weight, before and after the use of salt in the diet, they obtained a series of 42 observations, in some of which the same infant figured several times. In this series there were 27 favorable results and 15 unfavorable, though the latter all showed gains very little inferior to those of the period when salt was not taken. The ages of the infants varied from twelve days to four months, but the

good results were obtained without reference to the age at which the experiment was made.

The results seemed to be particularly successful with babies weighing less than 2 kgr., 500, for among 28 records 20 were favorable (71 per cent.), while the total percentage of favorable results was 64. It therefore seems that with premature and poorly nourished infants the addition of salt is especially valuable—an observation which appears to accord with the results of Nobecourt and Lemaire (*Bull. de la Soc. de Pédiatrie*, April, 1902), who found that the quantity of sodium chloride in kgr. of body-weight excreted by premature infants was greater than with other infants.

As to the effects of the different doses prescribed, all gave favorable results, but the smallest dose (0.25 gm.) gave 70 per cent. of successes, while 0.5 gm. gave 65 per cent., and 1 gm. only 58 per cent. These results are more striking if compared with the body-weight. In one class 1 cgm. of salt was given for 100 gms. and above to 140 gms., while in the second class 1 cgm. for less than 100 gm. of body-weight. In the first class there was 77 per cent. of successful results in all the cases, and 100 per cent. for infants below 2 kgr., 500, while in the second class there was only 63 per cent., and with doses of 1 cgm. for less than 50 gm. of weight it was 60 per cent. The larger doses sometimes gave rise to vomiting or diarrhœa.

The explanation of this improvement under the addition of salt is difficult. Various theories have been advanced: improvement of digestion and stimulation of general nutrition; increase of hydrochloric acid in the gastric juice; facilitation of the absorption of albumin. The authors suggest that it may be due to retention of water in the tissues because of insufficient renal elimination. Experimental investigation of the total urinary output of very young infants for several days, however, is practically impossible. Several observations of the blood in these cases, under the same conditions as to time, have shown no changes to indicate retention of water in the blood.

They therefore conclude that additional salt is valuable in the dietary of infants weighing less than 2 kgr., 500, and of premature infants, and that an average dose of 0.25 gm. per day, or, more exactly, 1 cgm. per 100 gm. of body-weight, is sufficient to give good results.

An Early Case of Friedreich's Ataxia.—At the February meeting of the Society for the Study of Diseases in Children (*British Journal of Children's Diseases*, May, 1904, p. 104) MR. JACKSON CLARKE showed a case of Friedreich's ataxia in a boy aged four years. He had dropping of both feet, exaggerated knee-jerks, Babinski's sign, and the parents had noticed some weakness of the left hand. An older brother, in whom the symptoms had begun at six years, had rigidity of the lower limbs and wasting of the muscles of the thumb. In the line of treatment in the early stages light instrumental guidance was advocated; later, tendon elongation and tenotomy, followed by massage.

Herpes Zoster Associated with Generalized Bullous Eruption from Prolonged Administration of Arsenic.—JAMES H. SEQUEIRA (*British Journal of Children's Diseases*, April, 1904, p. 158) records a case of herpes zoster caused by prolonged administration of arsenic, which

is interesting from the unusual association of a generalized bullous eruption. The patient was a girl, aged five years, who had been brought to the London Hospital in the summer of 1902 suffering from psoriasis. Three minims of Fowler's solution three times a day were ordered, and the lesions treated locally with an ointment of ichthyol and salicylic acid. The patient lived in the country, and was seen only at long intervals, but the treatment was not intermitted. About three months after the treatment was commenced the mother stated that she noticed that the skin of the trunk was darker than normal, but she attributed the change in color to the ointment. About four months after the child was first seen, during which time she was known to have been taking arsenic (though it is possible that the drug had been administered some time before) she was brought to the hospital with a crop of vesicles and bullæ all over the trunk. The lesions varied in size from that of a pin's head to 5 mm. in diameter. They were round, tense, and contained a clear fluid, and there was a narrow zone of hyperæmia around each. On the loin, hip, and the upper part of the thigh and the anterior aspect of the lower part of the abdomen of the right side there was a copious eruption of herpes zoster, corresponding with Heid's first lumbar area. The skin of the trunk was also pigmented. The color was a pale, yellowish brown, with the peculiar dappled appearance of arsenical pigmentation. The psoriasis had almost disappeared. The face and extremities were entirely free from vesicles, and the pigmentation was limited to the parts covered by the clothing. The child was in perfect health, and at no time had presented any signs of acute arsenical poisoning.

The arsenic was stopped, and all the lesions rapidly dried up, but the pigmentation persisted, beginning to disappear only after a year. The scars of the herpetic lesions persisted, but there was no scarring in the site of the bullæ.

A Contribution to the Study of Cerebrospinal Meningitis.—M. B. AUCHE (*Revue mensuelle des maladies de l'enfance*, January, 1904, p. 20) reports a case of pneumococcic cerebrospinal meningitis, which is noteworthy from the fact that its evolution was slow and that recovery ensued.

Diplopneumococcic meningitis is notably of greater gravity than the more frequently encountered meningococcic variety. In general, its onset is sudden, its evolution tumultuous, and its course rapidly fatal, especially in the metapneumonic cases. Rarely are cases observed in which the evolution is slow and the termination favorable.

The patient was a boy, aged five years, who had previously been in good health. He had coughed for several days before coming under observation, and had slight headache, an evening temperature of 103°, with frequent vomiting of a greenish, bilious fluid. At the base of the left lung was a small area of fine subcrepitant rales, without signs of consolidation. These symptoms rapidly subsided, and the temperature began to fall, but then appeared the first symptoms of meningitis, which, however, developed quite slowly. The symptoms noted from time to time were intense headache, without the hydroencephalic cry; repeated vomiting at the beginning; moderate constipation; pupillary dilatation equal on the two sides; photophobia; rigidity of the neck and trunk; Kernig's sign; slight exaggeration of the tendon reflexes;

rapidity and sometimes a little irregularity of the pulse; retraction of the belly—the tâche méningitique. There were no delirium, agitation, convulsion, or paralysis. The temperature was irregular, oscillating considerably within short periods. These symptoms lasted about five weeks, when they began to subside, and convalescence ensued. Three lumbar punctures were made, from the first two of which cultures showed colonies of a diplococcus exhibiting the biological and morphological characteristics of the pneumococcus. Its virulence was slight, since it failed to kill rabbits, and after the second puncture scarcely affected them.

This observation is of especial interest, since it illustrates the fact that with lessened virulence the pneumococcus may produce meningitic symptoms, which, from their slow onset and protracted course, resemble those of the milder cases due to the meningococcus.

OBSTETRICS.

UNDER THE CHARGE OF

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Eclampsia, its Causation and Treatment.—In the *Archiv für Gynäkologie*, Band lxxii., 1904, ZWEIFEL gives the results of his studies in eclampsia and its treatment in the laboratories and wards of the Leipzig Clinic.

He reviews the literature of the subject, drawing attention to the theories of Frerich, Traube-Rosenstein, Munk, Bidder and Otto, Speigelberg, Halbertsma, Bouchard, Massin, Hahn, Volhard and Schumacher, Scanzoni, Stumpf, Schmorl, Butte, Dienst, Schröder, Zangemeister, and others.

From these and other investigations it seems proven that the cause of eclampsia is a poison formed within the body of the patient and circulating within her blood. This poison attacks the epithelia of the parenchymatous organs, damages the heart muscle, and extensively disorganizes the blood. It was the aim of Zweifel's studies to ascertain the nature and identity of this poison.

He first examined the urine of the patient with reference to the percentage of urea, in view of the fact that in man urea represents 83 per cent. of the nitrogenous excreta. He also investigated the quantity of ammonia, of uric acid, and of albumin. He also investigated the amount of nitrogen in the purin bases and studied the relation of these various substances in healthy patients, and in those suffering from eclampsia. He observed that in eclampsia the quantity of urea in proportion to the entire nitrogenous waste is greatly lessened and also that the greater the quantity of albumin the lesser the quantity of urea.

If the quantity of urea during eclampsia increased, the quantity of albumin grew less. He believed it to be shown that a careful estimate of the quantity of albumin during the progress of a given case would indicate the increase or lessening of the urea, and so the improvement or lack of improvement in the patient. Inefficient oxidation of albuminoid materials affords the most rational explanation for the condition of the urine seen in eclampsia. He also investigated the quantity of urea in the blood, and found that it was impossible to use this as a means for prognosis.

In estimating the salts of ammonium he reviews Zangemeister's results, who found increased excretion of compounds of ammonium in eclampsia. From his own investigations he concludes that the poison of eclampsia is an organic acid capable of oxygenation and readily changeable into various compounds. He draws attention to leucomaines and ptomaines, and also to the sulphates in the urine of eclamptic patients as indicating the degree in which the unknown acid remains free or undergoes combination. He finds that the severer the case of eclampsia the smaller the quantity of sulphates in the urine, and so the greater the quantity of neutral sulphur. This account points to lack of oxidation of albuminoid materials as the primary cause of eclampsia.

In searching further to determine the nature of this acid he finds that lactic acid is the only one demonstrated by his investigations which is poisonous and which is not formed in the metabolism of healthy human beings. It is significant that cases of nephritis without eclampsia do not give the same results when metabolism is studied.

Clinically, he calls attention to cases of epilepsy in which the convulsions occur and which may be mistaken for eclampsia. He draws attention to cases of poisoning in which patients die with convulsions which are not the usual eclampsia. He also remarks the tendency to eclampsia seen in multiple pregnancy, and the failure of the theory of dilatation of the ureters to account for eclampsia.

Clinically, it is of great interest to observe that eclampsia differs much in frequency and in mortality in various portions of the world. In Würtemberg and in Vienna eclampsia is much less common than in other portions of the Continent of Europe. The explanation for this is found in the use of light wines and beverages containing tartrates of sodium and potassium, which combine with bases in the food preventing the formation of lactic acid.

In the matter of treatment in prophylaxis Zweifel would limit strictly the quantity of meat and eggs eaten and encourage the use of fruits and vegetables. Sugar and starch do these patients no harm, and may be permitted. He would also give effervescing beverages containing the tartrates and carbonates of sodium and potassium freely.

In the actual treatment of the convulsion he calls attention to the danger of using narcotics and especially chloroform for an indefinite period, as fatty degeneration of the heart muscle and epithelia of secreting organs has been observed in these cases. He is not in favor of profuse sweating, although he faithfully tried it, but saw no benefit. Pilocarpine should, in his belief, never be employed.

Formerly Zweifel was in favor of waiting for spontaneous dilatation of the uterus before delivering the child. The mortality among his cases was 32.6 per cent. Immediate delivery was then practised by

Dührssen's method of incision for three years, when the mortality sank to 15 per cent., and in some series 11.25 per cent. Glöckner had a similar experience. Bumm divides his treatment of eclampsia into three periods: one in which narcotics were freely used with 30 per cent. mortality; a second period, when, in addition to narcotics, baths and packs were used, with 30 per cent. mortality; and a third period, when delivery as soon as possible after the first convulsion was practised, with a mortality of 12 per cent. In Ohlshausen's clinic convulsions ceased after delivery in 81 per cent. of the cases. A mortality of 16.9 per cent. occurred.

He believes that the general practitioner in the presence of eclamptic convulsions should immediately rupture the membranes, and that this will have a good influence in lessening the convulsions. When the cervix is partly dilated dilatation may be completed by the hand or elastic bags, and delivery accomplished by forceps or version. If the vaginal portion of the cervix is still present Zweifel believes that Dührssen's incisions or vaginal Cæsarean section by Dührssen's method or Cæsarean section by abdominal operation, as recommended by Halbertsma, should be practised. He does not incline to the use of Bossi's dilator.

The Scar of Uterine Rupture Found in a Uterus Removed by Operation.—In the *Monatsschrift für Geburtshülfe und Gynäkologie*, Band xix., Heft 6, 1904, AMANN reports the case of a patient who suffered with a large abdominal hernia. During a difficult labor about two years previously, the patient had rupture of the uterus followed by the escape of the fœtus into the abdominal cavity. The physician in attendance performed abdominal section and sutured the uterus. Primary union did not occur, but suppuration persisted for some time with the formation of an extensive abdominal scar and hernia. The patient's condition was such as to greatly interfere with her work.

On examination a convolution of intestine as large as a child's head and covered by very thin integument was found protruding through the hernial opening. An abdominal cystic tumor was also present, which extended deeply into the pelvis.

On abdominal section the convolution of intestine was so adherent to the integument that its separation was performed with the greatest difficulty. The cystic tumor was intraligamentary and adherent to the intestine. The tumor was finally entirely removed, and was found to contain pus. The uterus was removed, the edges of the wound trimmed and brought together, and a drain of iodoform gauze passed through the abdominal wall and into the vagina. The hernial sac was dissected out, and the abdomen brought firmly together. The patient recovered without complications.

On examining the tumor it was found to be a suppurating dermoid. The tear in the uterus had extended from the lower uterine segment up upon the left side, and had opened into the left broad ligament. When the uterus was closed only the external tissues were brought together, and the muscular tissues remained ununited. As a consequence, the cavity of the uterus communicated with the cavity in the broad ligament. The dermoid tumor must have been a hindrance to labor, and may have predisposed to the rupture of the uterus. The suppuration of the dermoid tumor followed the primary operation

upon the womb. The adhesions were the natural consequence of the primary infection. The incomplete union in the uterine wall found in this case illustrates the rupture of the uterus after some of the primary and early operations for Cæsarean section. Those who performed these operations did not bring together the uterine wall accurately, but simply closed the peritoneal covering. As a result of this rupture readily occurred.

GYNECOLOGY.

UNDER THE CHARGE OF

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Vaginal Hysterectomy for Prolapsus.—STELZNER (abstract of Inaugural in *Zentralblatt für Gynäkologie*, No. 6, 1904) reports 80 cases from the clinic at Basle and Halle, with one death from causes foreign to the operation. Fifty-eight patients were kept under observation, 30 being entirely cured, 10 partially, while only 3 were unable to work. The ages of the patients ranged from thirty to sixty years.

Precocious Menstruation.—KLEMM (*Zentralblatt für Gynäkologie*, No. 6, 1904) reports the case of a girl, aged eleven years, in perfect health, who menstruated regularly every twenty-eight days. Although a child in other respects, her breasts and external genitals were fully developed, but not the sexual impulses. The writer collected 53 similar cases from the literature.

Treatment of Rupture of the Uterus.—SCHAEFFER (*Zentralblatt für Gynäkologie*, No. 7, 1904) reports 18 cases occurring in the Strasburg clinic in the course of ten years, 13 complete and 5 incomplete; 60 per cent. of the latter and 30 per cent. of the former recovered. Laparotomy was performed eight times, with four recoveries.

Anatomy of Chronic Metritis.—LORENTZ (*Archiv für Gynäkologie*, Band lxx., Heft 2) after his studies of nine uteri removed on account of persistent hemorrhage, agrees with Theilhaber's conclusions that the menorrhagia in chronic metritis is due not to disease of the vessel walls, but of the muscular tissue, which, being replaced by connective tissue, is unable to contract as usual. Hence venous stasis and hypertrophy of the uterus. Contrary to the usual opinion, the writer found no changes in the endometrium, and states that the commonly observed thickening of the vessel walls and consequent narrowing or closure of the lumen is not due to atheromatous changes, but is to be regarded as a physiological process the result of obliterating endarteritis.

THEILHABER (*ibid.*) in a paper on the same subject, based on examinations of one hundred uteri, emphasizes the fact that the essential pathological change in chronic metritis is connective-tissue hyperplasia of the myometrium rather than hyperplasia of the endometrium. Among etiological factors he enumerates adnexal disease, frequent childbearing, infection, parametritis, and sexual excess. Menorrhagia and leucorrhœa are the prominent symptoms. Curettement relieves the symptoms, but does not cure the disease.

Gonorrhœal Endometritis.—PARADI (*Orvosi Hetilap; Zentralblatt für Gynäkologie*, No. 7, 1904) has treated several hundred cases with intrauterine injections of argentamin (10 per cent.) and sodium lygosin (5 per cent.), with good results.

Primary Cancer of the Tube.—DIRNER and FONYO (*Szülészet és Nogyogyaszat; Zentralblatt für Gynäkologie*, No. 7, 1904) report two cases. The first was in a multipara, aged fifty years, who had had an abdominal tumor since the menopause, two years before. She succumbed to laparotomy from sepsis three days after double ovariotomy. Examination of the specimen showed primary adenocarcinoma of both tubes. Metastatic deposits were found in the diaphragm on autopsy. In the second case an ovarian cyst and enlarged tube were removed from a multipara, aged fifty-six years, who remained in good health three years after operation. Primary cancer of the tube was present.

Treatment of Retroversion.—GRAEFE (*Zentralblatt für Gynäkologie*, No. 7, 1904) believes that no treatment is necessary when the uterus is normal, since the symptoms are not due to the displacement alone, but to the accompanying neurasthenia. When the patient has a fixed idea that her trouble is due to the retroversion, he prefers Alexander's operation to the use of a pessary, especially if she is sterile.

The writer does not replace every retroverted pregnant uterus if the patient can be kept under constant observation, even though it may seem to be incarcerated (!). If the displaced pregnant organ is adherent he advises laparotomy. If it is hypertrophied or sensitive a pessary should be used; if the ovaries are also prolapsed operation is indicated.

SPERLING (*ibid.*) thinks that there are no symptoms characteristic of retroflexion, but that these vary according to the nervous condition of the patient. Hence in some women the displacement gives rise to no trouble. [These conservative views are timely when so many gynecologists are disposed to regard every case of displacement from a surgical standpoint.—H. C. C.]

Gonorrhœa of Skene's Glands.—POLLAK (*Zentralblatt für Gynäkologie*, 1903, No. 9) in a careful study of this subject, based on 100 cases of gonorrhœal urethritis, found gonococci in 45 per cent. In 68.8 per cent. of these one duct, and in 31 per cent. both ducts were involved. He describes at length an interesting case in which a husband was infected with gonorrhœa a year after the wife's initial infection, and, several months after repeated examinations of the urethral mucus had failed to show the presence of gonococci. Cocci were subsequently found in the ducts, in which they had evidently been present all the time.

Rectal Alimentation.—DEUCHER (*Korrespondenzblatt für Schweizer Aerzte*, Band xxxiii., Jahrg. No. 2) believes that the simplest solutions are best, preferably saline and sugar with opium. Concentrated solutions (10 to 20 per cent.) may be used without causing irritation if a little opium is added. He rejects milk, since the fat is not absorbed; milk-sugar is the form most likely to decompose in the intestines, and albumin and casein coagulate in the presence of colon bacilli. Milk added to other nutritive fluids favors this decomposition and hinders absorption. Alcohol should not be used per rectum if the stomach is irritable, since it increases the gastric secretions.

Method of Shortening the Round Ligament.—VILLARD (*Lyon méd.; Zentralblatt für Gynäkologie*, No. 7, 1904) makes a crescentic incision through the skin above the pubes, joining the external rings, pulls out the round ligaments and ties them over the recti muscles. Six successful cases are reported, three of the patients subsequently bearing children.

Treatment of Postoperative Intestinal Paralysis.—ARNDT (*Zentralblatt für Gynäkologie*, 1904, No. 9) reports a series of cases in which he used eserin hypodermically, never administering over 2 milligrams (gr. $\frac{1}{30}$) in the course of twenty-four hours. In all the cases there was marked tympanites, with pain, vomiting and rapid pulse, which symptoms were not relieved by gastric lavage and enemata. The patients (five) responded promptly to the treatment, flatus passing within two or three hours after the initial dose of gr. $\frac{1}{60}$.

Combined Cancer and Tuberculosis of the Uterus.—WALLART (*Zeitschrift für Geb. u. Gyn.*, Band l., Heft 2 and 3) adds a third case to the two reported by Kaufmann. In the first case the diagnosis was made by the presence of both cancerous and tubercular tissue in the material removed with the curette. The second patient developed cancer of the cervix subsequent to the secondary tubercular disease of the uterus.

In the case reported by the writer, the patient, aged thirty-seven years, had a circumscribed tubercular nodule of the corporeal endometrium associated with extensive adenocarcinoma. He infers that the combination is probably more common than is generally supposed, and that the presence of tuberculosis of the uterus may predispose the patient to the development of cancer.

The Curability of Cancer.—LOMER (*Zeitschrift für Geb. u. Gyn.*, Band l., Heft 2 and 3) collected from various sources records of 213 cases of uterine cancer treated with the cautery which were free from recurrence two years after operation; 149 patients were well after an interval of five years. Most of the patients had been regarded as inoperable. The writer believes that the effect of the heat is not only to destroy the cancerous tissue, but to effect such a radical change in the blood as to prevent recurrence. He insists on the application of the cautery to every suspicious nodule which appears in the scar after a radical operation, as well as on the necessity of repeated and thorough cauterization in inoperable cases. Arsenic should be administered as a routine measure.

Ureteral Surgery.—Franz (*Zeitschrift für Geb. u. Gyn.*, Band l., Heft 2 and 3) reports six cases of injury to the ureters during the course of difficult abdominal operations, in all of which the ureter was successfully implanted in the bladder.

The writer states, as the result of experiments and clinical observations, that the flow of urine through the implanted ureter is at first impeded in consequence of a localized œdema of the ureteral mucosa. This soon subsides, as a rule, though rarely complete occlusion of the duct may result. A certain amount of dilatation of both the ureter and the renal pelvis may follow this temporary œdema.

Advantages of Abdominovaginal Drainage.—Oberlaender (*Zeitschrift für Geb. u. Gyn.*, Band l., Heft 2 and 3) states that combined abdominal and vaginal drainage was employed in 20 per cent. of Orthmann's private abdominal sections between April, 1899, and April, 1902. Only two patients died.

The writer believes that this method is best for drainage, especially when a quantity of pus has escaped, when large raw surfaces are left, and when there is fear of a subsequent intestinal fistula.

Hæmatoma of the Ovary.—Potier (*Revue de gynécologie*, vol. vii., No. 5) includes under this head only hemorrhages into Graafian follicle. He reports the case of a young married woman, where the diagnosis of ectopic pregnancy had been made. An ovary the size of a hen's egg was removed, which contained several hemorrhagic cysts communicating with one another, as well as a number of follicles containing blood. The cortex was thickened as the result of inflammation, so that the follicles could not rupture. The hemorrhage was supposed to be due to excessive coitus.

Pneumococcus Peritonitis.—v. Brunn (*Beiträge zür klin. Chirurgie*, Band xxxix., Heft 1) reports 2 cases from the Tübingen clinic, making 72 now on record. The writer calls attention to the fact that the fluid in the peritoneal cavity is usually thick and fibrinous and that it tends to become encapsulated, thus rendering the prognosis favorable. These collections of fluid are most often found in the neighborhood of the umbilicus and in the iliac fossæ. The abdominal viscera are seldom involved, but the lungs, pleura, meninges and pericardium are frequently affected.

The disease is most common in girls under fifteen years, beginning as a pneumonia, followed by increased temperature, abdominal pain, vomiting and diarrhœa. The process is soon localized in the abdomen, and persists for several weeks, with variable temperature, moderate pain and gradual loss of strength. The fluid may be evacuated spontaneously, but surgical intervention is preferable. In adults the diagnosis is more difficult, as it is liable to be mistaken for typhoid or tubercular peritonitis. It is characterized by an acute onset, followed by localization in the abdomen. Early incision and drainage are indicated.

Sarcomatous Degeneration of Fibroids.—Hauber (Munich inaugural dissertation: abstract in *Zentralblatt für Gynäkologie*, 1904, No. 11) found 3 cases among 138 cases of fibromyoma in Klein's clinic. He infers that about 3 per cent. of all fibroids undergo sarcomatous degen-

eration. After the menopause such tumors should never be regarded as harmless, but should be kept under constant observation, and should be promptly removed if they begin to increase in size. The statistics of myoma operations are now so good that it is better to extirpate them early rather than to wait until rapid growth is noted. An exception is made, however, in the case of tumors which increase in size under the influence of pregnancy.

DERMATOLOGY.

UNDER THE CHARGE OF

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A Papuloexudative Dermatosis Produced by Pilocarpine.—HALLOPEAU and VIELLARD (*Annales de Dermatologie et de Syphiligraphie*, 1904, No. 3) report a case of extensive eruption following the prolonged use of pilocarpine. The patient, a man aged fifty-two years, consulted a distinguished ophthalmologist for some trouble of vision, who diagnosed an episcleritis and increased ocular tension, for which he prescribed instillations of 0.05 per cent. solution of pilocarpine and hypodermic injections of 0.05 centigram to 1 centigram of the same drug. Under this treatment the vision improved, but after thirty-five hypodermic injections and about eighty instillations an eruption appeared which occupied the face, the trunk, and the limbs. This eruption was a polymorphous one, consisting of papules, vesicles, pustules, and impetiginous crusts; some of the lesions were umbilicated like the eruption of smallpox. Symptoms of systemic intoxication accompanied the eruption, and at the end of two months the patient died.

Histological examination of the eruptive lesions revealed an inflammatory exudate about the excretory ducts of the sweat glands. The authors conclude, from a study of this unusual case, that pilocarpine introduced into the organism for a prolonged period by hypodermic injection and by instillation may give rise to an eruption of umbilicated papulæ which are situated in the sweat glands, the place of election for the eruption being the face and limbs. The exudate, at first serous, soon becomes purulent. This eruption differs in its clinical characters from all the dermatoses hitherto described, and is accompanied by grave disturbance of the general health, particularly of cerebral and cardiac innervation. The eruption is unaccompanied by fever. No antidote for pilocarpine is known, nor any efficacious way of eliminating it.

The Cutaneous Manifestations of Appendicitis.—MOTY, in a communication made to the Société Francaise de Dermatologie et de Syphiligraphie (*Annales de Dermatologie et de Syphiligraphie*, 1904,

No. 2), calls attention to certain cutaneous troubles associated with appendicitis. These vary according to the form of appendicitis which produces them, being acute and transitory in the acute form of the affection, disappearing with the febrile period, but having a very long duration, with an insidious beginning in the chronic variety. The most frequent cutaneous manifestation of acute appendicitis is congestive redness of the right cheek, recalling that which is observed in pneumonia; this redness is rarely wanting in the febrile forms with sharp reaction. In graver cases labial herpes occurs, situated most frequently upon the right side, although it may also occur upon the left. The extent of the eruption is in proportion to the sharpness of the reaction; a group of herpetic vesicles covering a small part of the surface of the lip will ordinarily correspond to an acute appendicitis of moderate gravity, while a series of herpetic plaques extending toward the right ear will coincide with a more serious attack.

Cutaneous manifestations are much rarer in chronic appendicitis, the author having met with but a single case. A surgeon, after an attack of diarrhœa, the nature of which was misunderstood at the time, suffered from unilateral sweating of the head and neck, which persisted for ten years, with mild exacerbations when the patient's general health was not good or when he suffered from abdominal troubles. Immediately after an operation made necessary by a brusque attack of appendicitis the sweating disappeared.

Lupus Erythematosus with Bullous Beginning.—AUDRY (*Annales de Dermatologie et de Syphiligraphie*, 1904, No. 2) reports a case of erythematous lupus which followed an eruption of bullæ. A girl, aged thirteen years, who had at various times suffered from epileptiform crises, which were believed to be due to hysteria rather than to epilepsy, after taking bromide of potassium suddenly presented an eruption of bullæ covering the face. This eruption, after treatment with poultices, disappeared very slowly. Two years later, when Audry saw her for the first time, the face was entirely well, except two plaques in the malar region, which presented the features of a well-characterized erythematous lupus. Later the patient again had an eruption of small bullæ situated upon the lips and chin, which occurred independently of the administration of bromide of potassium, and disappeared in the course of eight or ten days without leaving any trace.

A Case of Larva Migrans.—LENGLET and DELAUNAY (*Annales de Dermatologie et de Syphiligraphie*, 1904, No. 2) report in detail a new case of this very curious affection. A joiner, aged thirty-nine years, having a furuncle upon the calf, treated it with a remedy of his own for ten days, viz., the application of live snails; later it was cauterized with the thermocautery. About a month later there was a dark-red plaque, the size of the palm of the hand, upon the outer side of the right calf, having in its centre the scar of the initial furuncle and the furrows of the thermocautery. Upon this plaque were a number of tunnels like enormous itch burrows, with red borders and whitish centres, distended by a seropurulent fluid collected here and there in drops. They were markedly elevated and measured at their greatest width 3 mm. These burrows ran in all directions, but there seemed to be one principal

burrow always running in the same general direction, of which the others seemed to be branches. They advanced at the rate of 3 cm. to 4 cm. a day. All efforts to find the parasite were in vain. Sections made of these burrows showed that they were situated within the epidermis, and in places some of the cells looked as if they had undergone disintegration and digestion. In the corium beneath there was a considerable infiltrate of lymphoid cells, among which, and in the cells included in the burrow, were a number of eosinophiles. The authors suppose that the parasite gained access to the skin through the poultice of snails applied to the furuncle by the patient.

Paget's Disease.—FABRY and TRAUTMANN (*Archiv für Dermatologie und Syphilis*, Band lxix., Heft 1 and 2) report the results of their study of a new case of this disease. They found nothing especially new as to the histology of the disease, but in the epithelium about the margin of the diseased area, in sections made from various portions of the eroded surface and the axillary gland of the affected side, they found, by staining with alum hæmatoxylin, peculiar round corpuscles with darkly stained margins and clear centres, which they regarded as yeast bodies. In sections these bodies formed coarsely granular masses contained in cavities in the cutis. Pure cultures were obtained within twenty-four hours. The authors conclude that Paget's disease is an affection *sui generis*, belonging neither to eczema nor carcinoma, which, owing to its very chronic course and situation in the epidermis, offers specially favorable conditions for the development of carcinoma. Should the presence of the yeast fungus be confirmed by subsequent investigations, the question would arise whether this malady should not be looked upon as a blastomycosis.

Tuberculosis of the Skin.—KLINGMÜLLER (*Archiv für Dermatologie und Syphilis*, Band lxix., Heft 1 and 2) reports some of the results of his study, clinical and experimental, of a number of tuberculous affections of the skin. In 18 cases of lichen scrofulosorum 3 followed injections of tuberculin; these 3 cases presented no appreciable clinical differences from the other cases. In not a single one of the whole series of cases was it possible to demonstrate the presence of the tubercle bacillus, although more than 700 preparations were examined. The form which followed tuberculin infections was observed only in those who already showed evidences of tuberculosis or scrofula, although many such injections were made in other patients for the purpose of learning whether, beside some dermatosis, tuberculosis or scrofula existed.

As eczema scrofulosorum, the author reports the case of a young woman, who, besides lupus vulgaris of the forearm and a lichen scrofulosorum, had a brownish-red, scaly patch upon the calf, which was not well-defined, but gradually faded away into the surrounding parts. Examination of an excised portion of the patch showed a slight perivascular infiltration about the horizontal and ascending branches of the papillary vessels and a tubercle-like focus with giant and epithelioid cells in the fat tissue. No tubercle bacilli were demonstrable. The author thinks it possible that this patch may have been a beginning erythema induratum.

A case of lupus vulgaris occurring at the site of a tuberculin injection

also was observed in a woman who had suffered from lupus of the upper lip and the nose. The histological changes present in this lesion were like those seen in ordinary lupus tissue.

As to the etiology of lichen scrofulosorum, Klingmüller believes it is an affection which occurs only in tuberculous subjects, not as the direct effect of the tubercle bacillus, but through toxic materials produced by this organism. Lupus vulgaris is caused by virulent tubercle bacilli capable of multiplication. As the skin and subcutaneous tissue do not offer favorable conditions for their multiplication, they are found in small numbers. The author thinks the case of inoculation lupus reported makes the supposition probable that the extensive tissue changes in lupus arise from the action of toxic matter coming from the bacilli, which may be either an excretion product of the living organism or an extract of dead bacilli.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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The Elastic Tissue of the Ventricles of the Heart.—POSCHARISKY (*Ziegler's Beiträge*, 1904, Band xxxv. p. 510) studied the elastic tissue of the ventricles in a number of animals and in fifty individuals dead of various diseases. Of these fifty hearts only one was normal. Sections through the ventricle of this normal heart showed that the adventitia about the large bloodvessels was richly provided with elastic fibres, which ran from this zone along the coarser bundles of connective tissue that pierce the ventricular wall as well as into the heart's flesh, where they surrounded the muscle cells in the form of loops. From the epicardium as well as from the endocardium elastic fibres spread along the vessels into the myocardium. In 70 per cent. of the hearts from persons over forty years of age an increase could be made out in the intermuscular elastic fibres. In persons under this age it was rare to find such an increase. The striking hyperplasia of the elastic tissue seen in chronic myocardial affections appeared either in the adventitia of the vessels or in the outer layer of the endocardium, but the intermuscular fibrils played no part in the process.

Improved Technique of Agglutination Test in Typhoid Fever; the Use of Formalized Cultures.—It has been shown by Pröscher that a twenty-four-hour bouillon culture of bacillus typhosus which has been killed with formalin gives the same specific agglutinating reaction as the living culture when mixed with blood or blood serum from a typhoid-fever patient.

REUDIGER (*Journal of Infectious Diseases*, 1904, vol. i. p. 236) describes a method of using this reaction for clinical purposes. A large quantity of plain bouillon (100 to 1000 c.c.) is inoculated with bacillus typhosus and incubated at 36° C. for twenty-four hours. Afterward 1 c.c of formalin is added for every 100 c.c of bouillon. The culture is now ready for use, except that it must be shaken before it is used, because the dead organisms gradually settle to the bottom. A culture prepared in this manner can be kept for many months. To perform the serum test four drops of the patient's blood are collected in a small test-tube containing 2 c.c. of a 1:500 solution of formalin in distilled water. By this means the blood becomes laked, and a clear solution of the blood in approximately a 1:10 dilution is obtained. To 1 c.c. of the blood solution 4 c.c. of the dead cultures are added, making a dilution of about 1:50. The tube is now set aside. A control tube is made by mixing 1 c.c. of a 1:10 solution of normal blood or 1 c.c. of distilled water with 4 c.c. of the culture. If agglutination takes place the dead organisms collect in clumps, and within an hour or two are seen as a flocculent precipitate settling toward the bottom, leaving the bouillon clear at the end of twelve to twenty-four hours. In a series of experiments the agglutinative reaction obtained with dead and living bacilli were compared, and it was found that the two methods gave practically the same results. This method of performing the serum test with dead bacilli obviates the necessity of living cultures, microscope, and other apparatus outside of a few small test-tubes, and seems to the author suitable for hospitals, boards of health, and private practice.

The Chemistry of the Urine in Diseases of the Pancreas.—It is now admitted by most authorities that in fat necrosis consecutive to certain diseases of the pancreas, the masses of free fatty acids or the combination of them with lime, which constitutes the lesion, are directly derived from the fat of the affected part by the fermentation of the pancreatic secretion, and that the other constituent of the fat molecule, viz., glycerin, is absorbed in the circulation. Catillon has shown that if glycerin is given by mouth to dogs 50 to 60 per cent. of the amount is excreted in the urine. With this idea in mind CAMMIDGE (*Lancet*, 1904, i. p. 782) has studied the urine in cases of pancreatic disease, and finds that by certain methods it is possible to demonstrate a constituent which is not present in normal urines. This substance is glycerin. By heating the urine with nitric acid the glycerin is converted into glycerose. For the detection of glycerose phenylhydrazin was employed. To carry out this test two procedures are necessary:

(*a*) The urine is filtered and 10 c.c. are poured into a small flask; 1 c.c. of strong hydrochloric acid is added, and, a funnel having been placed in the neck to act as a condenser, the flask is placed on a sand-bath and gently boiled for ten minutes after the first sign of ebullition has appeared. A mixture of 5 c.c. of the filtered urine and 5 c.c. of distilled water is then poured into the flask, which is afterward cooled in running water. The excess of acid is now neutralized by slowly adding four grams of lead carbonate, and after standing for a few minutes to allow of the completion of the reaction, the urine is filtered through a moistened filter paper, and the flask is washed out with 5 c.c. of distilled water onto the filter. To the clear filtrate are now added 2 grams of powdered sodium acetate and 0.75 gram of phenylhydrazin hydro-

chlorate, and the mixture is boiled for from three to four minutes on a sand-bath. The hot fluid is then poured into a test-tube and allowed to cool undisturbed. After the lapse of from one to twenty-four hours a more or less abundant flocculent yellow deposit is found at the bottom of the tube, which consists of sheaves and rosettes of golden yellow crystals. As both sugar and albumin vitiate the experiment these substances must be thoroughly removed before the test is made. Since it was found that the urine not only in pancreatitis but in carcinoma of the pancreas and in certain other conditions when there was a destruction of tissue yield these crystals, a second experiment was necessary to eliminate these factors.

(*b*) 20 c.c. of urine are filtered and thoroughly mixed with half its bulk of a saturated solution of perchloride of mercury. After standing for a few minutes, it is carefully filtered, and to 10 c.c. of the filtrate 1 c.c. of strong hydrochloric acid is added. After this procedure the steps are the same as in (*a*). If the case is one of pancreatitis the yellow crystals are not found in the urine treated by the (*b*) process. In malignant disease the crystals are present. Besides this differentiation the crystals showed varying degrees of solubility in strong sulphuric acid. Crystals from cases of acute pancreatitis dissolve in from a few seconds to half a minute. Crystals from cases of chronic pancreatitis dissolve in one to two minutes, while in carcinoma of the pancreas solution takes place in from three to five minutes.

Observations made with the urine from three cases of acute pancreatitis, fifty-one cases of chronic pancreatitis, and fifteen cases of malignant disease showed that the test was surprisingly accurate. Mistakes are more likely to be made in cases of cancer of the pancreas, although in thirteen out of the fifteen instances a correct diagnosis was made by the urine examination. The author considers the reaction of great assistance in differentiating the acute and chronic forms of pancreatitis from diseases simulating these conditions.

Change in the Spleen in Pernicious Anæmia, etc.—KURPJUWEIT (*Deutsch. Archiv für klin. Med.*, 1904, Band lxxx. p. 168) studied, by means of smear preparations and sections, the cellular elements of the spleen from cases of pernicious anæmia and from other diseases. He finds in every spleen finely granular cells which he interprets as myelocytes. Eosinophilic myelocytes and normoblasts are only seen in spleens which have suffered alteration through congestion, infectious processes, and severe anæmias. The author believes that under certain conditions the spleen may undergo myeloid transformation, partly through the proliferation of the pre-existing myelocytes and partly through emigration fo other cells, to which class belong the eosinophiles and normoblasts.

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